



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 9 Oram Way, West End
Southampton, SO30 3JW

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 17/12/2021

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 9	Issued on Date	17/12/2021
Assessment Reference	As Built	Prop Type Ref	Eh
Property	9 Oram Way, West End, Southampton, SO30 3JW		
SAP Rating	88 B	DER	13.08
Environmental	89 B	% DER<TER	26.24
CO ₂ Emissions (t/year)	1.01	DFEE	47.60
General Requirements Compliance	Pass	% DFEE<TFEE	18.70
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

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)	17.73	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.08	kgCO ₂ /m ²	Pass
	-4.65 (-26.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.55	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	47.60	kWh/m ² /yr	
	-10.9 (-18.6%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.95 (measured in this dwelling)	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 been produced by an accredited Elmhurst member whose work is subject to quality assurance audits. The data used to produce the report has been verified by the Elmhurst members' portal.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 36CDi Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

2.88 m², No overhang

Windows facing East

8.89 m², Overhang twice as wide as window, ratio 0.77

Windows facing South

0.96 m², No overhang

Windows facing West

8.63 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

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.95 (measured in this dwelling) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Thermal bridging ψ -value	0.028	W/m ² K
Air permeability	4.0	m ³ /m ² h
Photovoltaic array	1.28	kW

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THERMAL BRIDGING

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SAP Rating	88 B	DER	13.08	TER	17.73
Environmental	89 B	% DER<TER	26.24		
CO ₂ Emissions (t/year)	1.01	DFEE	47.60	TFEE	58.55
General Requirements Compliance	Pass	% DFEE<TFEE	18.70		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	18.40	0.98	CD0025
External wall	E3 Sill	Independently assessed	0.034	15.88	0.54	CD0027
External wall	E4 Jamb	Independently assessed	0.039	37.80	1.47	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.060	30.90	1.85	CBA - 302
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	30.90	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	13.89	0.83	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	16.93	0.91	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	25.25	1.26	CD0035
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.065	5.05	-0.33	CD0036

Total: **7.53** W/mK:
Y-Value: **0.028** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	1.01	DFEE	47.60	TFEE	58.55
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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

DWELLING AS BUILT

Detached House, total floor area 113 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) 17.73 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.08 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)58.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)47.6 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.95 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Worcester Greenstar 36CDi Compact ErP

Combi boiler

Efficiency: 89.8% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:	Average
Windows facing North:	2.88 m ² , No overhang
Windows facing East:	8.89 m ² , Overhang twice as wide as window, ratio 0.77
Windows facing South:	0.96 m ² , No overhang
Windows facing West:	8.63 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Floor U-value	0.12 W/m ² K
Door U-value	1.10 W/m ² K
Thermal bridging y-value	0.028 W/m ² K
Air permeability	4.0 m ³ /m ² h
Photovoltaic array	1.28 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	56.5700 (1b)	x 2.3900 (2b)	= 135.2023 (1b) - (3b)
First floor	56.5700 (1c)	x 2.6700 (2c)	= 151.0419 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.2442 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3372 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3372 (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	0.4300	0.4216	0.4131	0.3710	0.3625	0.3204	0.3204	0.3119	0.3372	0.3625	0.3794	0.3963 (22b)
Effective ac	0.5924	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.5700	0.1200	6.7884	84.0000	4751.8800 (28a)
Brick and Block	156.3500	23.4800	132.8700	0.2400	31.8888	42.2200	5609.7714 (29a)
Pitched Roof	56.5700		56.5700	0.1000	5.6570	9.1000	514.7870 (30)
Total net area of external elements Aum(A, m ²)			269.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.1242		(33)
GF Block			75.2700			75.0000	5645.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			119.6500			9.0000	1076.8500 (32c)
Internal Floor 1			56.5700			18.0000	1018.2600 (32d)
Internal Ceiling 1			56.5700			18.0000	1018.2600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19913.2484 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 176.0054 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5252 (36)
Total fabric heat loss (33) + (36) = 78.6494 (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	55.9624	55.6234	55.2910	53.7299	53.4378	52.0781	52.0781	51.8263	52.6019	53.4378	54.0287	54.6464 (38)
Heat transfer coeff	134.6119	134.2728	133.9404	132.3793	132.0872	130.7275	130.7275	130.4757	131.2513	132.0872	132.6781	133.2958 (39)
Average = Sum(39)m / 12 =												132.3779 (39)
HLP	1.1898	1.1868	1.1838	1.1700	1.1675	1.1554	1.1554	1.1532	1.1601	1.1675	1.1727	1.1781 (40)
HLP (average)												1.1700 (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												2.8324 (42)
Average daily hot water use (litres/day)												101.4699 (43)
Daily hot water use	111.6169	107.5581	103.4993	99.4405	95.3817	91.3229	91.3229	95.3817	99.4405	103.4993	107.5581	111.6169 (44)
Energy conte	165.5246	144.7689	149.3885	130.2406	124.9689	107.8387	99.9284	114.6693	116.0388	135.2320	147.6163	160.3018 (45)
Energy content (annual)										Total = Sum(45)m =		1596.5168 (45)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	24.8287	21.7153	22.4083	19.5361	18.7453	16.1758	14.9893	17.2004	17.4058	20.2848	22.1424	24.0453 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589 (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	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589 (64)
Heat gains from water heating, kWh/month	61.9283	54.3597	56.5597	49.9656	48.4286	42.5038	40.0907	44.9998	45.2375	51.8467	55.7480	60.1896 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1920.5811 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9525	22.1626	18.0238	13.6452	10.1999	8.6112	9.3047	12.0946	16.2334	20.6120	24.0573	25.6460 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.9924	278.8563	271.6393	256.2751	236.8805	218.6524	206.4749	203.6109	210.8280	226.1922	245.5867	263.8148 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621 (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)	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967 (71)
Water heating gains (Table 5)	83.2370	80.8924	76.0211	69.3966	65.0921	59.0330	53.8854	60.4835	62.8298	69.6865	77.4278	80.9000 (72)
Total internal gains	452.6681	450.3976	434.1704	407.8032	380.6589	354.7829	338.1512	344.6754	358.3775	384.9769	415.5580	438.8471 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.8800	10.6334	0.6300	0.7000	0.7700	9.3591 (74)
East	8.8900	19.6403	0.6300	0.7000	0.7700	53.3606 (76)
South	0.9600	46.7521	0.6300	0.7000	0.7700	13.7165 (78)
West	8.6300	19.6403	0.6300	0.7000	0.7700	51.8000 (80)

Solar gains	128.2363	246.0665	397.7935	575.2583	705.0008	722.7085	687.5631	589.8481	460.4555	289.6204	158.9274	106.1336 (83)
Total gains	580.9044	696.4640	831.9639	983.0615	1085.6597	1077.4913	1025.7144	934.5234	818.8329	674.5973	574.4855	544.9807 (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	41.0919	41.1957	41.2979	41.7849	41.8773	42.3129	42.3129	42.3945	42.1440	41.8773	41.6908	41.4976
alpha	3.7395	3.7464	3.7532	3.7857	3.7918	3.8209	3.8209	3.8263	3.8096	3.7918	3.7794	3.7665
util living area	0.9953	0.9902	0.9758	0.9326	0.8372	0.6828	0.5320	0.5944	0.8300	0.9645	0.9916	0.9963 (86)
MIT	19.2074	19.4186	19.7850	20.2613	20.6552	20.8908	20.9680	20.9516	20.7557	20.2197	19.6262	19.1739 (87)
Th 2	19.9282	19.9306	19.9329	19.9440	19.9461	19.9558	19.9558	19.9576	19.9521	19.9461	19.9419	19.9375 (88)
util rest of house	0.9941	0.9878	0.9695	0.9143	0.7926	0.5997	0.4180	0.4789	0.7660	0.9515	0.9891	0.9954 (89)
MIT 2	18.2898	18.5016	18.8659	19.3366	19.6993	19.8974	19.9450	19.9396	19.7998	19.3065	18.7179	18.2634 (90)
Living area fraction									fLA = Living area / (4) =			0.1214 (91)
MIT	18.4012	18.6129	18.9775	19.4489	19.8154	20.0180	20.0693	20.0625	19.9159	19.4174	18.8282	18.3739 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4012	18.6129	18.9775	19.4489	19.8154	20.0180	20.0693	20.0625	19.9159	19.4174	18.8282	18.3739 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9917	0.9836	0.9620	0.9037	0.7862	0.6051	0.4310	0.4914	0.7634	0.9428	0.9853	0.9934 (94)
Ext temp.	576.0730	685.0077	800.3365	888.3513	853.5989	651.9835	442.1142	459.1957	625.1167	635.9802	566.0255	541.3823 (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	1898.1900	1841.2725	1671.2403	1396.4541	1071.9382	708.2849	453.5299	477.8670	763.3429	1164.6716	1556.0747	1889.3268 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating	983.6551	777.0099	647.9524	365.8340	162.4444	0.0000	0.0000	0.0000	0.0000	393.3464	712.8354	1002.8707 (98)
Space heating per m2												5045.9484 (98)
(98) / (4) = 44.5992 (99)												

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													5563.3389	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	983.6551	777.0099	647.9524	365.8340	162.4444	0.0000	0.0000	0.0000	0.0000	393.3464	712.8354	1002.8707	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	1084.5149	856.6813	714.3908	403.3451	179.1008	0.0000	0.0000	0.0000	0.0000	433.6785	785.9266	1105.7009	(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	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589	(64)	
Efficiency of water heater (217)m	90.2284	90.1851	90.0845	89.8411	89.3224	87.9000	87.9000	87.9000	87.9000	89.8622	90.1359	90.2465	(216)	
Fuel for water heating, kWh/month	214.0015	188.1298	196.4162	174.6227	170.7013	152.9332	144.9220	161.7271	162.2948	181.1222	193.3509	208.1621	(219)	
Water heating fuel used												2148.3839	(219)	
Annual totals kWh/year														
Space heating fuel - main system													5563.3389	(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)													440.6689	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 1.28 * 853 * 1.00) =										-873.5026			-873.5026	(233)
Total delivered energy for all uses													7353.8890	(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	5563.3389	0.2160	1201.6812	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2148.3839	0.2160	464.0509	(264)
Space and water heating			1665.7321	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	440.6689	0.5190	228.7072	(268)
Energy saving/generation technologies				
PV Unit	-873.5026	0.5190	-453.3479	(269)
Total CO2, kg/year			1480.0164	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.0800	(273)

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

DER		13.0800	ZC1
Total Floor Area		113.1400	
Assumed number of occupants		2.8324	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		14.4553	ZC2
CO2 emissions from cooking, equation (L16)		1.6526	ZC3
Total CO2 emissions		29.1879	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		29.1879	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.5700 (1b)	x 2.3900 (2b)	= 135.2023 (1b) - (3b)
First floor	56.5700 (1c)	x 2.6700 (2c)	= 151.0419 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.2442 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3897 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3897 (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	0.4969	0.4872	0.4774	0.4287	0.4190	0.3703	0.3703	0.3605	0.3897	0.4190	0.4385	0.4579 (22b)
Effective ac	0.6235	0.6187	0.6140	0.5919	0.5878	0.5685	0.5685	0.5650	0.5759	0.5878	0.5961	0.6049 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			21.3600	1.3258	28.3182		(27)					
Ground Floor			56.5700	0.1300	7.3541		(28a)					
Brick and Block	156.3500	23.4800	132.8700	0.1800	23.9166		(29a)					
Pitched Roof	56.5700		56.5700	0.1300	7.3541		(30)					
Total net area of external elements Aum(A, m2)			269.4900				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		69.0630		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.2152 (36)					
Total fabric heat loss						(33) + (36) =	81.2782 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	58.8928	58.4400	57.9961	55.9111	55.5210	53.7050	53.7050	53.3687	54.4045	55.5210	56.3101	57.1351 (38)
Heat transfer coeff	140.1710	139.7181	139.2742	137.1892	136.7991	134.9832	134.9832	134.6469	135.6827	136.7991	137.5883	138.4133 (39)
Average = Sum(39)m / 12 =												137.1874 (39)
HLP	Jan 1.2389	Feb 1.2349	Mar 1.2310	Apr 1.2126	May 1.2091	Jun 1.1931	Jul 1.1931	Aug 1.1901	Sep 1.1992	Oct 1.2091	Nov 1.2161	Dec 1.2234 (40)
HLP (average)												1.2125 (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												2.8324 (42)
Average daily hot water use (litres/day)												101.4699 (43)
Daily hot water use	111.6169	107.5581	103.4993	99.4405	95.3817	91.3229	91.3229	95.3817	99.4405	103.4993	107.5581	111.6169 (44)
Energy conte	165.5246	144.7689	149.3885	130.2406	124.9689	107.8387	99.9284	114.6693	116.0388	135.2320	147.6163	160.3018 (45)
Energy content (annual)										Total = Sum(45)m =		1596.5168 (45)
Distribution loss (46)m = 0.15 x (45)m	24.8287	21.7153	22.4083	19.5361	18.7453	16.1758	14.9893	17.2004	17.4058	20.2848	22.1424	24.0453 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	49.0392	48.6055	45.0360	46.5372	48.6055	49.0392	50.9589	49.3151	50.9589 (61)
Solar input	216.4835	190.7963	200.3474	179.2797	173.5744	152.8746	146.4655	163.2748	165.0779	186.1909	196.9314	211.2607 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	216.4835	190.7963	200.3474	179.2797	173.5744	152.8746	146.4655	163.2748	165.0779	186.1909	196.9314	211.2607 (64)
Heat gains from water heating, kWh/month	67.7767	59.6425	62.4114	55.5648	53.7035	47.1153	44.8605	50.2789	50.8427	57.7044	61.4112	66.0401 (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	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9525	22.1626	18.0238	13.6452	10.1999	8.6112	9.3047	12.0946	16.2334	20.6120	24.0573	25.6460	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.9924	278.8563	271.6393	256.2751	236.8805	218.6524	206.4749	203.6109	210.8280	226.1922	245.5867	263.8148	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	(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)	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	(71)
Water heating gains (Table 5)	91.0977	88.7537	83.8863	77.1733	72.1822	65.4380	60.2963	67.5792	70.6148	77.5596	85.2933	88.7635	(72)
Total internal gains	460.5288	458.2589	442.0357	415.5798	387.7489	361.1879	344.5622	351.7710	366.1625	392.8501	423.4236	446.7106	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				2.8800	10.6334	0.6300	0.7000	0.7700	9.3591 (74)			
East				8.8900	19.6403	0.6300	0.7000	0.7700	53.3606 (76)			
South				0.9600	46.7521	0.6300	0.7000	0.7700	13.7165 (78)			
West				8.6300	19.6403	0.6300	0.7000	0.7700	51.8000 (80)			
Solar gains	128.2363	246.0665	397.7935	575.2583	705.0008	722.7085	687.5631	589.8481	460.4555	289.6204	158.9274	106.1336 (83)
Total gains	588.7651	704.3253	839.8291	990.8382	1092.7497	1083.8963	1032.1253	941.6191	826.6179	682.4705	582.3510	552.8442 (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	56.0526	56.2342	56.4135	57.2709	57.4342	58.2068	58.2068	58.3522	57.9068	57.4342	57.1047	56.7644	
alpha	4.7368	4.7489	4.7609	4.8181	4.8289	4.8805	4.8805	4.8901	4.8605	4.8289	4.8070	4.7843	
util living area	0.9989	0.9972	0.9910	0.9647	0.8849	0.7244	0.5583	0.6261	0.8766	0.9848	0.9977	0.9992	(86)
MIT	19.5683	19.7353	20.0288	20.4221	20.7493	20.9352	20.9854	20.9754	20.8259	20.3836	19.9079	19.5477	(87)
Th 2	19.8890	19.8922	19.8953	19.9100	19.9127	19.9256	19.9256	19.9279	19.9206	19.9127	19.9072	19.9013	(88)
util rest of house	0.9985	0.9962	0.9876	0.9506	0.8397	0.6302	0.4307	0.4955	0.8099	0.9766	0.9967	0.9989	(89)
MIT 2	17.9781	18.2244	18.6538	19.2265	19.6651	19.8823	19.9203	19.9177	19.7757	19.1820	18.4876	17.9565	(90)
Living area fraction	18.1712	18.4079	18.8208	19.3717	19.7967	20.0102	20.0496	20.0462	19.9032	19.3279	18.6601	18.1498	(91)
Temperature adjustment	18.1712	18.4079	18.8208	19.3717	19.7967	20.0102	20.0496	20.0462	19.9032	19.3279	18.6601	18.1498	(92)
adjusted MIT	18.1712	18.4079	18.8208	19.3717	19.7967	20.0102	20.0496	20.0462	19.9032	19.3279	18.6601	18.1498	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9976	0.9942	0.9827	0.9414	0.8340	0.6383	0.4460	0.5108	0.8086	0.9701	0.9949	0.9982	(94)
Ext temp.	587.3324	700.2181	825.3079	932.8165	911.3480	691.8364	460.3373	481.0085	668.4006	662.0565	579.3937	551.8491	(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	1944.3376	1887.2950	1715.9652	1436.6097	1107.6276	730.2851	465.6396	490.9481	787.3968	1193.9749	1590.5308	1930.8331	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	1009.6118	797.7156	662.6490	362.7310	146.0320	0.0000	0.0000	0.0000	0.0000	395.7473	728.0187	1025.9641	(98)
												5128.4696	(98)
												45.3285	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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													5490.8668 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1009.6118	797.7156	662.6490	362.7310	146.0320	0.0000	0.0000	0.0000	0.0000	395.7473	728.0187	1025.9641	(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)	1080.9548	854.0853	709.4743	388.3630	156.3512	0.0000	0.0000	0.0000	0.0000	423.7124	779.4632	1098.4626	(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	216.4835	190.7963	200.3474	179.2797	173.5744	152.8746	146.4655	163.2748	165.0779	186.1909	196.9314	211.2607	(64)
Efficiency of water heater (217)m	88.4360	88.2574	87.8352	86.7893	84.6197	80.3000	80.3000	80.3000	80.3000	86.9028	88.0423	88.4993	(216)
Fuel for water heating, kWh/month	244.7911	216.1817	228.0947	206.5690	205.1228	190.3794	182.3979	203.3310	205.5765	214.2519	223.6782	238.7145	(219)
Water heating fuel used												2559.0888	(219)
Annual totals kWh/year													
Space heating fuel - main system												5490.8668	(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)												440.6689	(232)
Total delivered energy for all uses												8565.6245	(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	5490.8668	0.2160	1186.0272 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2559.0888	0.2160	552.7632 (264)
Space and water heating			1738.7904 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	440.6689	0.5190	228.7072 (268)
Total CO2, kg/m2/year			2006.4226 (272)
Emissions per m2 for space and water heating			15.3685 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.0215 (272b)
Emissions per m2 for pumps and fans			0.3440 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3685 * 1.00) + 2.0215 + 0.3440, rounded to 2 d.p.			17.7300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	56.5700 (1b)	x 2.3900 (2b)	= 135.2023 (1b) - (3b)
First floor	56.5700 (1c)	x 2.6700 (2c)	= 151.0419 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.2442 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3372 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3372 (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	0.4300	0.4216	0.4131	0.3710	0.3625	0.3204	0.3204	0.3119	0.3372	0.3625	0.3794	0.3963 (22b)
Effective ac	0.5924	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.5700	0.1200	6.7884	84.0000	4751.8800 (28a)
Brick and Block	156.3500	23.4800	132.8700	0.2400	31.8888	42.2200	5609.7714 (29a)
Pitched Roof	56.5700		56.5700	0.1000	5.6570	9.1000	514.7870 (30)
Total net area of external elements Aum(A, m ²)			269.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.1242		(33)
GF Block			75.2700			75.0000	5645.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			119.6500			9.0000	1076.8500 (32c)
Internal Floor 1			56.5700			18.0000	1018.2600 (32d)
Internal Ceiling 1			56.5700			9.0000	509.1300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19404.1184 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 171.5054 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5252 (36)
 Total fabric heat loss (33) + (36) = 78.6494 (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	55.9624	55.6234	55.2910	53.7299	53.4378	52.0781	52.0781	51.8263	52.6019	53.4378	54.0287	54.6464 (38)
Heat transfer coeff	134.6119	134.2728	133.9404	132.3793	132.0872	130.7275	130.7275	130.4757	131.2513	132.0872	132.6781	133.2958 (39)
Average = Sum(39)m / 12 =												132.3779 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1898	1.1868	1.1838	1.1700	1.1675	1.1554	1.1554	1.1532	1.1601	1.1675	1.1727	1.1781 (40)
HLP (average)												1.1700 (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												2.8324 (42)
Average daily hot water use (litres/day)												101.4699 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.6169	107.5581	103.4993	99.4405	95.3817	91.3229	91.3229	95.3817	99.4405	103.4993	107.5581	111.6169 (44)
Energy conte	165.5246	144.7689	149.3885	130.2406	124.9689	107.8387	99.9284	114.6693	116.0388	135.2320	147.6163	160.3018 (45)
Energy content (annual)										Total = Sum(45)m =		1596.5168 (45)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	35.1740	30.7634	31.7451	27.6761	26.5559	22.9157	21.2348	24.3672	24.6582	28.7368	31.3685	34.0641 (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	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9525	22.1626	18.0238	13.6452	10.1999	8.6112	9.3047	12.0946	16.2334	20.6120	24.0573	25.6460	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.9924	278.8563	271.6393	256.2751	236.8805	218.6524	206.4749	203.6109	210.8280	226.1922	245.5867	263.8148	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	(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)	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	(71)
Water heating gains (Table 5)	47.2769	45.7789	42.6681	38.4391	35.6934	31.8274	28.5414	32.7516	34.2476	38.6247	43.5673	45.7851	(72)
Total internal gains	413.7080	412.2840	397.8175	373.8456	348.2601	324.5773	309.8072	313.9435	326.7952	350.9152	378.6976	400.7322	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					2.8800	10.6334	0.6300	0.7000	0.7700		9.3591 (74)	
East					8.8900	19.6403	0.6300	0.7000	0.7700		53.3606 (76)	
South					0.9600	46.7521	0.6300	0.7000	0.7700		13.7165 (78)	
West					8.6300	19.6403	0.6300	0.7000	0.7700		51.8000 (80)	
Solar gains	128.2363	246.0665	397.7935	575.2583	705.0008	722.7085	687.5631	589.8481	460.4555	289.6204	158.9274	106.1336 (83)
Total gains	541.9443	658.3505	795.6109	949.1039	1053.2610	1047.2857	997.3704	903.7915	787.2506	640.5356	537.6250	506.8658 (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	40.0413	40.1424	40.2420	40.7166	40.8066	41.2310	41.2310	41.3106	41.0665	40.8066	40.6249	40.4366	
alpha	3.6694	3.6762	3.6828	3.7144	3.7204	3.7487	3.7487	3.7540	3.7378	3.7204	3.7083	3.6958	
util living area	0.9959	0.9912	0.9776	0.9363	0.8442	0.6933	0.5433	0.6081	0.8404	0.9679	0.9926	0.9968	(86)
MIT	19.1318	19.3483	19.7248	20.2164	20.6270	20.8781	20.9632	20.9442	20.7312	20.1713	19.5609	19.0982	(87)
Th 2	19.9282	19.9306	19.9329	19.9440	19.9461	19.9558	19.9558	19.9576	19.9521	19.9461	19.9419	19.9375	(88)
util rest of house	0.9949	0.9890	0.9718	0.9189	0.8012	0.6111	0.4283	0.4922	0.7791	0.9561	0.9905	0.9960	(89)
MIT 2	18.2172	18.4344	18.8092	19.2959	19.6763	19.8894	19.9431	19.9363	19.7816	19.2622	18.6556	18.1906	(90)
Living area fraction									fLA = Living area / (4) =			0.1214	(91)
MIT	18.3282	18.5454	18.9204	19.4077	19.7918	20.0095	20.0670	20.0587	19.8969	19.3726	18.7656	18.3009	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3282	18.5454	18.9204	19.4077	19.7918	20.0095	20.0670	20.0587	19.8969	19.3726	18.7656	18.3009	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	537.9722	648.4736	767.2747	861.8180	836.1796	644.8139	440.0617	455.8243	610.3347	606.9191	530.6234	503.9429	(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	1888.3654	1832.2070	1663.5949	1391.0016	1068.8215	707.1702	453.2280	477.3701	760.8563	1158.7425	1547.7660	1879.5848	(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	1004.6926	795.4689	666.8622	381.0122	173.0855	0.0000	0.0000	0.0000	0.0000	410.5566	732.3427	1023.4776	(98)
Space heating												5187.4983	(98)
Space heating per m2												(98) / (4) =	45.8503 (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	1228.8388	967.3838	991.6157	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8211	0.8827	0.8489	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1008.9527	853.9114	841.7954	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1335.9017	1275.0951	1167.7932	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	235.4033	313.3607	242.5424	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												791.3064 (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	58.8508	78.3402	60.6356	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												197.8266 (107)
Space cooling per m2												1.7485 (108)
Energy for space heating												45.8503 (99)
Energy for space cooling												1.7485 (108)
Total												47.5988 (109)
Dwelling Fabric Energy Efficiency (DFEE)												47.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	56.5700 (1b)	x 2.3900 (2b)	= 135.2023 (1b) - (3b)
First floor	56.5700 (1c)	x 2.6700 (2c)	= 151.0419 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.2442 (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																4 * 10 =	40.0000 (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) =										40.0000 / (5) =							0.1397 (8)
Pressure test										Yes							
Measured/design AP50																	5.0000
Infiltration rate																	0.3897 (18)
Number of sides sheltered																	0 (19)
Shelter factor										(20) = 1 - [0.075 x (19)] =							1.0000 (20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =							0.3897 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	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	0.4969	0.4872	0.4774	0.4287	0.4190	0.3703	0.3703	0.3605	0.3897	0.4190	0.4385	0.4579	(22b)				
Effective ac	0.6235	0.6187	0.6140	0.5919	0.5878	0.5685	0.5685	0.5650	0.5759	0.5878	0.5961	0.6049	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			21.3600	1.3258	28.3182		(27)					
Ground Floor			56.5700	0.1300	7.3541		(28a)					
Brick and Block	156.3500	23.4800	132.8700	0.1800	23.9166		(29a)					
Pitched Roof	56.5700		56.5700	0.1300	7.3541		(30)					
Total net area of external elements Aum(A, m2)			269.4900				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	69.0630		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.2152 (36)					
Total fabric heat loss						(33) + (36) =	81.2782 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 58.8928	Feb 58.4400	Mar 57.9961	Apr 55.9111	May 55.5210	Jun 53.7050	Jul 53.7050	Aug 53.3687	Sep 54.4045	Oct 55.5210	Nov 56.3101	Dec 57.1351 (38)
Heat transfer coeff	140.1710	139.7181	139.2742	137.1892	136.7991	134.9832	134.9832	134.6469	135.6827	136.7991	137.5883	138.4133 (39)
Average = Sum(39)m / 12 =												137.1874 (39)
HLP	Jan 1.2389	Feb 1.2349	Mar 1.2310	Apr 1.2126	May 1.2091	Jun 1.1931	Jul 1.1931	Aug 1.1901	Sep 1.1992	Oct 1.2091	Nov 1.2161	Dec 1.2234 (40)
HLP (average)												1.2125 (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												2.8324 (42)
Average daily hot water use (litres/day)												101.4699 (43)
Daily hot water use	Jan 111.6169	Feb 107.5581	Mar 103.4993	Apr 99.4405	May 95.3817	Jun 91.3229	Jul 91.3229	Aug 95.3817	Sep 99.4405	Oct 103.4993	Nov 107.5581	Dec 111.6169 (44)
Energy conte	165.5246	144.7689	149.3885	130.2406	124.9689	107.8387	99.9284	114.6693	116.0388	135.2320	147.6163	160.3018 (45)
Energy content (annual)										Total = Sum(45)m =		1596.5168 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000 (59)
	35.1740	30.7634	31.7451	27.6761	26.5559	22.9157	21.2348	24.3672	24.6582	28.7368	31.3685	34.0641	(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	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	141.6209	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9525	22.1626	18.0238	13.6452	10.1999	8.6112	9.3047	12.0946	16.2334	20.6120	24.0573	25.6460	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.9924	278.8563	271.6393	256.2751	236.8805	218.6524	206.4749	203.6109	210.8280	226.1922	245.5867	263.8148	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	37.1621	(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)	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	(71)
Water heating gains (Table 5)	47.2769	45.7789	42.6681	38.4391	35.6934	31.8274	28.5414	32.7516	34.2476	38.6247	43.5673	45.7851	(72)
Total internal gains	413.7080	412.2840	397.8175	373.8456	348.2601	324.5773	309.8072	313.9435	326.7952	350.9152	378.6976	400.7322	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF		Access factor Table 6d		Gains W
North				2.8800	10.6334	0.6300		0.7000		0.7700		9.3591 (74)
East				8.8900	19.6403	0.6300		0.7000		0.7700		53.3606 (76)
South				0.9600	46.7521	0.6300		0.7000		0.7700		13.7165 (78)
West				8.6300	19.6403	0.6300		0.7000		0.7700		51.8000 (80)
Solar gains	128.2363	246.0665	397.7935	575.2583	705.0008	722.7085	687.5631	589.8481	460.4555	289.6204	158.9274	106.1336 (83)
Total gains	541.9443	658.3505	795.6109	949.1039	1053.2610	1047.2857	997.3704	903.7915	787.2506	640.5356	537.6250	506.8658 (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	56.0526	56.2342	56.4135	57.2709	57.4342	58.2068	58.2068	58.3522	57.9068	57.4342	57.1047	56.7644		
alpha	4.7368	4.7489	4.7609	4.8181	4.8289	4.8805	4.8805	4.8901	4.8605	4.8289	4.8070	4.7843		
util living area	0.9992	0.9979	0.9928	0.9699	0.8964	0.7416	0.5753	0.6472	0.8925	0.9882	0.9984	0.9995	(86)	
MIT	19.5302	19.6982	19.9942	20.3931	20.7306	20.9281	20.9835	20.9716	20.8079	20.3515	19.8716	19.5102	(87)	
Th 2	19.8890	19.8922	19.8953	19.9100	19.9127	19.9256	19.9256	19.9279	19.9206	19.9127	19.9072	19.9013	(88)	
util rest of house	0.9990	0.9972	0.9900	0.9575	0.8540	0.6479	0.4450	0.5146	0.8307	0.9817	0.9977	0.9993	(89)	
MIT 2	18.5463	18.7165	19.0135	19.4162	19.7288	19.8923	19.9214	19.9198	19.8089	19.3829	18.9018	18.5360	(90)	
Living area fraction														
MIT	18.6658	18.8358	19.1326	19.5348	19.8504	20.0181	20.0504	20.0475	19.9302	19.5005	19.0196	18.6543	(92)	
Temperature adjustment														
adjusted MIT	18.6658	18.8358	19.1326	19.5348	19.8504	20.0181	20.0504	20.0475	19.9302	19.5005	19.0196	18.6543	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9985	0.9962	0.9873	0.9520	0.8511	0.6568	0.4608	0.5305	0.8314	0.9782	0.9968	0.9990	(94)
Ext temp.	541.1538	655.8172	785.5433	903.5884	896.4752	687.8382	459.6340	479.4411	654.4874	626.5527	535.9255	506.3345	(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	2013.6668	1947.0782	1759.3944	1458.9816	1114.9737	731.3548	465.7411	491.1243	791.0565	1217.5818	1639.9929	2000.6714	(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	1095.5496	867.7274	724.5452	399.8831	162.5629	0.0000	0.0000	0.0000	0.0000	439.7257	794.9285	1111.7867	(98)
Space heating per m2													
										(98) / (4) =		49.4671	(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	1268.8418	998.8755	1023.3163	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8506	0.9137	0.8800	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1079.2562	912.6254	900.5543	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1335.9017	1275.0951	1167.7932	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	184.7848	269.6775	198.8258	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												653.2881 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	46.1962	67.4194	49.7064	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling												163.3220 (107)
Space cooling per m2												1.4435 (108)
Energy for space heating												49.4671 (99)
Energy for space cooling												1.4435 (108)
Total												50.9107 (109)
Target Fabric Energy Efficiency (TFEE)												58.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	56.5700 (1b)	x 2.3900 (2b)	= 135.2023 (1b) - (3b)
First floor	56.5700 (1c)	x 2.6700 (2c)	= 151.0419 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.2442 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3372 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3372 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate												
	0.3963	0.3710	0.3710	0.3372	0.3457	0.3288	0.3288	0.3204	0.3204	0.3457	0.3372	0.3457 (22b)
Effective ac	0.5785	0.5688	0.5688	0.5569	0.5597	0.5541	0.5541	0.5513	0.5513	0.5597	0.5569	0.5597 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.5700	0.1200	6.7884	84.0000	4751.8800 (28a)
Brick and Block	156.3500	23.4800	132.8700	0.2400	31.8888	42.2200	5609.7714 (29a)
Pitched Roof	56.5700		56.5700	0.1000	5.6570	9.1000	514.7870 (30)
Total net area of external elements Aum(A, m ²)			269.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.1242		(33)
GF Block			75.2700			75.0000	5645.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			119.6500			9.0000	1076.8500 (32c)
Internal Floor 1			56.5700			18.0000	1018.2600 (32d)
Internal Ceiling 1			56.5700			18.0000	1018.2600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19913.2484 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 176.0054 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5252 (36)
Total fabric heat loss (33) + (36) = 78.6494 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	54.6464	53.7299	53.7299	52.6019	52.8738	52.3366	52.3366	52.0781	52.0781	52.8738	52.6019	52.8738 (38)
Heat transfer coeff	133.2958	132.3793	132.3793	131.2513	131.5232	130.9860	130.9860	130.7275	130.7275	131.5232	131.2513	131.5232 (39)
Average = Sum(39)m / 12 =												131.5461 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1781	1.1700	1.1700	1.1601	1.1625	1.1577	1.1577	1.1554	1.1554	1.1625	1.1601	1.1625 (40)
HLP (average)												1.1627 (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												2.8324 (42)
Average daily hot water use (litres/day)												101.4699 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	111.6169	107.5581	103.4993	99.4405	95.3817	91.3229	91.3229	95.3817	99.4405	103.4993	107.5581	111.6169 (44)
Energy conte	165.5246	144.7689	149.3885	130.2406	124.9689	107.8387	99.9284	114.6693	116.0388	135.2320	147.6163	160.3018 (45)
Energy content (annual)										Total = Sum(45)m =		1596.5168 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	24.8287	21.7153	22.4083	19.5361	18.7453	16.1758	14.9893	17.2004	17.4058	20.2848	22.1424	24.0453 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589 (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	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589 (64)
RHI water heating demand												1920.5811 (64)
Heat gains from water heating, kWh/month	61.9283	54.3597	56.5597	49.9656	48.4286	42.5038	40.0907	44.9998	45.2375	51.8467	55.7480	60.1896 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1920.5811 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.3812	55.4065	45.0596	34.1130	25.4999	21.5281	23.2618	30.2366	40.5835	51.5301	60.1432	64.1150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	411.9289	416.2034	405.4317	382.5001	353.5530	326.3468	308.1715	303.8969	314.6686	337.6002	366.5473	393.7535 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269 (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)	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967 (71)
Water heating gains (Table 5)	83.2370	80.8924	76.0211	69.3966	65.0921	59.0330	53.8854	60.4835	62.8298	69.6865	77.4278	80.9000 (72)
Total internal gains	672.0224	666.9776	640.9877	600.4850	558.6203	521.3832	499.7939	509.0923	532.5572	573.2921	618.5936	653.2438 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	FF	Specific data or Table 6c	Access factor Table 6d	Gains W	
North				2.8800	13.4684		0.6300		0.7000	0.7700	11.8544 (74)	
East				8.8900	25.1733		0.6300		0.7000	0.7700	68.3932 (76)	
South				0.9600	56.5862		0.6300		0.7000	0.7700	16.6017 (78)	
West				8.6300	25.1733		0.6300		0.7000	0.7700	66.3930 (80)	
Solar gains	163.2423	266.8689	438.8908	635.3264	730.6818	827.8187	757.0730	679.1713	531.2862	338.9397	201.7330	127.8340 (83)
Total gains	835.2647	933.8464	1079.8785	1235.8114	1289.3021	1349.2018	1256.8669	1188.2636	1063.8434	912.2317	820.3266	781.0778 (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	41.4976	41.7849	41.7849	42.1440	42.0569	42.2294	42.2294	42.3129	42.3129	42.0569	42.1440	42.0569
alpha	3.7665	3.7857	3.7857	3.8096	3.8038	3.8153	3.8153	3.8209	3.8209	3.8038	3.8096	3.8038
util living area	0.9797	0.9687	0.9341	0.8457	0.6992	0.4774	0.3400	0.3478	0.6265	0.8776	0.9621	0.9831 (86)
MIT	19.6712	19.8341	20.1748	20.5833	20.8514	20.9742	20.9947	20.9945	20.9291	20.6002	20.0938	19.6555 (87)
Th 2	19.9375	19.9440	19.9440	19.9521	19.9501	19.9540	19.9540	19.9558	19.9558	19.9501	19.9521	19.9501 (88)
util rest of house	0.9746	0.9611	0.9180	0.8096	0.6332	0.3867	0.2342	0.2364	0.5312	0.8378	0.9510	0.9788 (89)
MIT 2	18.7566	18.9212	19.2508	19.6358	19.8588	19.9439	19.9530	19.9549	19.9229	19.6604	19.1847	18.7512 (90)
Living area fraction									fLA = Living area / (4) =			0.1214 (91)
MIT	18.8676	19.0320	19.3630	19.7509	19.9793	20.0690	20.0795	20.0811	20.0451	19.7745	19.2951	18.8610 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8676	19.0320	19.3630	19.7509	19.9793	20.0690	20.0795	20.0811	20.0451	19.7745	19.2951	18.8610 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9678	0.9526	0.9072	0.8017	0.6352	0.3970	0.2471	0.2500	0.5400	0.8299	0.9419	0.9728 (94)
Ext temp.	808.3821	889.5510	979.6963	990.8021	818.9822	535.6415	310.5333	297.0679	574.4526	757.0446	772.6849	759.8402 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1768.5214	1725.1701	1557.1831	1266.6909	904.7936	546.0854	311.6815	298.2044	607.2386	1009.3743	1403.7408	1730.9752 (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	714.3436	561.5361	429.6502	198.6400	63.8437	0.0000	0.0000	0.0000	0.0000	187.7333	454.3602	722.5245 (98)
RHI space heating demand												3332.6316 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	56.5700 (1b)	x 2.3900 (2b)	= 135.2023 (1b) - (3b)
First floor	56.5700 (1c)	x 2.6700 (2c)	= 151.0419 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.2442 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3372 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3372 (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	0.4300	0.4216	0.4131	0.3710	0.3625	0.3204	0.3204	0.3119	0.3372	0.3625	0.3794	0.3963 (22b)
Effective ac	0.5924	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.5700	0.1200	6.7884	84.0000	4751.8800 (28a)
Brick and Block	156.3500	23.4800	132.8700	0.2400	31.8888	42.2200	5609.7714 (29a)
Pitched Roof	56.5700		56.5700	0.1000	5.6570	9.1000	514.7870 (30)
Total net area of external elements Aum(A, m ²)			269.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.1242		(33)
GF Block			75.2700			75.0000	5645.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			119.6500			9.0000	1076.8500 (32c)
Internal Floor 1			56.5700			18.0000	1018.2600 (32d)
Internal Ceiling 1			56.5700			18.0000	1018.2600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19913.2484 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							176.0054 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5252 (36)
Total fabric heat loss						(33) + (36) =	78.6494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	55.9624	55.6234	55.2910	53.7299	53.4378	52.0781	52.0781	51.8263	52.6019	53.4378	54.0287	54.6464 (38)
Average = Sum(39)m / 12 =	134.6119	134.2728	133.9404	132.3793	132.0872	130.7275	130.7275	130.4757	131.2513	132.0872	132.6781	133.2958 (39)
												132.3779 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1898	1.1868	1.1838	1.1700	1.1675	1.1554	1.1554	1.1532	1.1601	1.1675	1.1727	1.1781 (40)
HLP (average)												1.1700 (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												2.8324 (42)
Average daily hot water use (litres/day)												101.4699 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.6169	107.5581	103.4993	99.4405	95.3817	91.3229	91.3229	95.3817	99.4405	103.4993	107.5581	111.6169 (44)
Energy conte	165.5246	144.7689	149.3885	130.2406	124.9689	107.8387	99.9284	114.6693	116.0388	135.2320	147.6163	160.3018 (45)
Energy content (annual)										Total = Sum(45)m =		1596.5168 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	24.8287	21.7153	22.4083	19.5361	18.7453	16.1758	14.9893	17.2004	17.4058	20.2848	22.1424	24.0453 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589 (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	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589 (64)
Heat gains from water heating, kWh/month	61.9283	54.3597	56.5597	49.9656	48.4286	42.5038	40.0907	44.9998	45.2375	51.8467	55.7480	60.1896 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1920.5811 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.3812	55.4065	45.0596	34.1130	25.4999	21.5281	23.2618	30.2366	40.5835	51.5301	60.1432	64.1150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	411.9289	416.2034	405.4317	382.5001	353.5530	326.3468	308.1715	303.8969	314.6686	337.6002	366.5473	393.7535	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	(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)	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	(71)
Water heating gains (Table 5)	83.2370	80.8924	76.0211	69.3966	65.0921	59.0330	53.8854	60.4835	62.8298	69.6865	77.4278	80.9000	(72)
Total internal gains	672.0224	666.9776	640.9877	600.4850	558.6203	521.3832	499.7939	509.0923	532.5572	573.2921	618.5936	653.2438	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.8800	10.6334	0.6300	0.7000	0.7700	9.3591 (74)
East	8.8900	19.6403	0.6300	0.7000	0.7700	53.3606 (76)
South	0.9600	46.7521	0.6300	0.7000	0.7700	13.7165 (78)
West	8.6300	19.6403	0.6300	0.7000	0.7700	51.8000 (80)

Solar gains	128.2363	246.0665	397.7935	575.2583	705.0008	722.7085	687.5631	589.8481	460.4555	289.6204	158.9274	106.1336	(83)
Total gains	800.2587	913.0440	1038.7811	1175.7433	1263.6211	1244.0916	1187.3570	1098.9404	993.0127	862.9124	777.5210	759.3774	(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	41.0919	41.1957	41.2979	41.7849	41.8773	42.3129	42.3129	42.3945	42.1440	41.8773	41.6908	41.4976	
alpha	3.7395	3.7464	3.7532	3.7857	3.7918	3.8209	3.8209	3.8263	3.8096	3.7918	3.7794	3.7665	
util living area	0.9864	0.9767	0.9532	0.8932	0.7800	0.6158	0.4683	0.5203	0.7541	0.9285	0.9775	0.9887	(86)
MIT	19.4341	19.6357	19.9766	20.4051	20.7380	20.9236	20.9792	20.9692	20.8305	20.3822	19.8314	19.3976	(87)
Th 2	19.9282	19.9306	19.9329	19.9440	19.9461	19.9558	19.9558	19.9576	19.9521	19.9461	19.9419	19.9375	(88)
util rest of house	0.9831	0.9713	0.9420	0.8675	0.7289	0.5336	0.3642	0.4132	0.6806	0.9056	0.9713	0.9860	(89)
MIT 2	18.5144	18.7152	19.0507	19.4673	19.7647	19.9165	19.9491	19.9467	19.8524	19.4572	18.9194	18.4854	(90)
Living area fraction									fLA = Living area / (4) =			0.1214	(91)
MIT	18.6261	18.8270	19.1631	19.5812	19.8829	20.0388	20.0742	20.0709	19.9712	19.5695	19.0302	18.5962	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6261	18.8270	19.1631	19.5812	19.8829	20.0388	20.0742	20.0709	19.9712	19.5695	19.0302	18.5962	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9778	0.9639	0.9318	0.8571	0.7255	0.5405	0.3764	0.4254	0.6821	0.8954	0.9642	0.9814	(94)
Useful gains	782.5260	880.0986	967.9664	1007.7447	916.8052	672.4792	446.9706	467.4886	677.3761	772.6913	749.6469	745.2346	(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													
	1928.4659	1870.0176	1696.1036	1413.9634	1080.8564	711.0025	454.1720	478.9599	770.5995	1184.7626	1582.8762	1918.9524	(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													
	852.5793	665.2256	541.7341	292.4775	122.0540	0.0000	0.0000	0.0000	0.0000	306.5810	599.9251	873.2461	(98)
Space heating													
Space heating per m2												4253.8228	(98)
										(98) / (4) =		37.5979	(99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4689.9920 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	852.5793	665.2256	541.7341	292.4775	122.0540	0.0000	0.0000	0.0000	0.0000	306.5810	599.9251	873.2461	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	939.9992	733.4351	597.2813	322.4669	134.5690	0.0000	0.0000	0.0000	0.0000	338.0165	661.4389	962.7851	(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	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589	(64)
Efficiency of water heater (217)m	90.1696	90.1166	89.9942	89.7024	89.1232	87.9000	87.9000	87.9000	87.9000	89.7090	90.0543	90.1914	(216)
Fuel for water heating, kWh/month	214.1410	188.2728	196.6132	174.8927	171.0828	152.9332	144.9220	161.7271	162.2948	181.4315	193.5262	208.2893	(219)
Water heating fuel used												2150.1266	(219)
Annual totals kWh/year													
Space heating fuel - main system												4689.9920	(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)												440.6689	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.28 * 853 * 1.00) =									-873.5026			-873.5026	(233)
Total delivered energy for all uses												6482.2848	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4689.9920	3.4800	163.2117 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2150.1266	3.4800	74.8244 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	440.6689	13.1900	58.1242 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-873.5026	13.1900	-115.2150 (252)
Total energy cost			310.8379 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8255 (257)
SAP value		88.4836
SAP rating (Section 12)		88 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4689.9920	0.2160	1013.0383 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2150.1266	0.2160	464.4273 (264)
Space and water heating			1477.4656 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	440.6689	0.5190	228.7072 (268)
Energy saving/generation technologies			
PV Unit	-873.5026	0.5190	-453.3479 (269)
Total kg/year			1291.7499 (272)
CO2 emissions per m2			11.4200 (273)
EI value			89.0544
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8922 = 3.900$, stars = 4
Water heating environmental impact	$0.216 / 0.8922 = 0.2421$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (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	56.5700 (1b)	x 2.3900 (2b)	= 135.2023 (1b) - (3b)
First floor	56.5700 (1c)	x 2.6700 (2c)	= 151.0419 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.2442 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3372 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3372 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.3963	0.3710	0.3710	0.3372	0.3457	0.3288	0.3288	0.3204	0.3204	0.3457	0.3372	0.3457 (22b)
Effective ac	0.5785	0.5688	0.5688	0.5569	0.5597	0.5541	0.5541	0.5513	0.5513	0.5597	0.5569	0.5597 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.5700	0.1200	6.7884	84.0000	4751.8800 (28a)
Brick and Block	156.3500	23.4800	132.8700	0.2400	31.8888	42.2200	5609.7714 (29a)
Pitched Roof	56.5700		56.5700	0.1000	5.6570	9.1000	514.7870 (30)
Total net area of external elements Aum(A, m ²)			269.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.1242		(33)
GF Block			75.2700			75.0000	5645.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			119.6500			9.0000	1076.8500 (32c)
Internal Floor 1			56.5700			18.0000	1018.2600 (32d)
Internal Ceiling 1			56.5700			18.0000	1018.2600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19913.2484 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 176.0054 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5252 (36)
Total fabric heat loss (33) + (36) = 78.6494 (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	54.6464	53.7299	53.7299	52.6019	52.8738	52.3366	52.3366	52.0781	52.0781	52.8738	52.6019	52.8738 (38)
Heat transfer coeff	133.2958	132.3793	132.3793	131.2513	131.5232	130.9860	130.9860	130.7275	130.7275	131.5232	131.2513	131.5232 (39)
Average = Sum(39)m / 12 =												131.5461 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1781	1.1700	1.1700	1.1601	1.1625	1.1577	1.1577	1.1554	1.1554	1.1625	1.1601	1.1625 (40)
HLP (average)												1.1627 (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												2.8324 (42)
Average daily hot water use (litres/day)												101.4699 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.6169	107.5581	103.4993	99.4405	95.3817	91.3229	91.3229	95.3817	99.4405	103.4993	107.5581	111.6169 (44)
Energy conte	165.5246	144.7689	149.3885	130.2406	124.9689	107.8387	99.9284	114.6693	116.0388	135.2320	147.6163	160.3018 (45)
Energy content (annual)										Total = Sum(45)m =		1596.5168 (45)

FULL SAP CALCULATION PRINTOUT

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

Distribution loss (46)m = 0.15 x (45)m	24.8287	21.7153	22.4083	19.5361	18.7453	16.1758	14.9893	17.2004	17.4058	20.2848	22.1424	24.0453 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589 (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	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589 (64)
Heat gains from water heating, kWh/month	61.9283	54.3597	56.5597	49.9656	48.4286	42.5038	40.0907	44.9998	45.2375	51.8467	55.7480	60.1896 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1920.5811 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.3812	55.4065	45.0596	34.1130	25.4999	21.5281	23.2618	30.2366	40.5835	51.5301	60.1432	64.1150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	411.9289	416.2034	405.4317	382.5001	353.5530	326.3468	308.1715	303.8969	314.6686	337.6002	366.5473	393.7535 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269 (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)	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967 (71)
Water heating gains (Table 5)	83.2370	80.8924	76.0211	69.3966	65.0921	59.0330	53.8854	60.4835	62.8298	69.6865	77.4278	80.9000 (72)
Total internal gains	672.0224	666.9776	640.9877	600.4850	558.6203	521.3832	499.7939	509.0923	532.5572	573.2921	618.5936	653.2438 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.8800	13.4684	0.6300	0.7000	0.7700	11.8544 (74)
East	8.8900	25.1733	0.6300	0.7000	0.7700	68.3932 (76)
South	0.9600	56.5862	0.6300	0.7000	0.7700	16.6017 (78)
West	8.6300	25.1733	0.6300	0.7000	0.7700	66.3930 (80)

Solar gains	163.2423	266.8689	438.8908	635.3264	730.6818	827.8187	757.0730	679.1713	531.2862	338.9397	201.7330	127.8340 (83)
Total gains	835.2647	933.8464	1079.8785	1235.8114	1289.3021	1349.2018	1256.8669	1188.2636	1063.8434	912.2317	820.3266	781.0778 (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	41.4976	41.7849	41.7849	42.1440	42.0569	42.2294	42.2294	42.3129	42.3129	42.0569	42.1440	42.0569
alpha	3.7665	3.7857	3.7857	3.8096	3.8038	3.8153	3.8153	3.8209	3.8209	3.8038	3.8096	3.8038
util living area	0.9797	0.9687	0.9341	0.8457	0.6992	0.4774	0.3400	0.3478	0.6265	0.8776	0.9621	0.9831 (86)
MIT	19.6712	19.8341	20.1748	20.5833	20.8514	20.9742	20.9947	20.9945	20.9291	20.6002	20.0938	19.6555 (87)
Th 2	19.9375	19.9440	19.9440	19.9521	19.9501	19.9540	19.9540	19.9558	19.9558	19.9501	19.9521	19.9501 (88)
util rest of house	0.9746	0.9611	0.9180	0.8096	0.6332	0.3867	0.2342	0.2364	0.5312	0.8378	0.9510	0.9788 (89)
MIT 2	18.7566	18.9212	19.2508	19.6358	19.8588	19.9439	19.9530	19.9549	19.9229	19.6604	19.1847	18.7512 (90)
Living area fraction									fLA = Living area / (4) =			0.1214 (91)
MIT	18.8676	19.0320	19.3630	19.7509	19.9793	20.0690	20.0795	20.0811	20.0451	19.7745	19.2951	18.8610 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8676	19.0320	19.3630	19.7509	19.9793	20.0690	20.0795	20.0811	20.0451	19.7745	19.2951	18.8610 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9678	0.9526	0.9072	0.8017	0.6352	0.3970	0.2471	0.2500	0.5400	0.8299	0.9419	0.9728 (94)
Ext temp.	808.3821	889.5510	979.6963	990.8021	818.9822	535.6415	310.5333	297.0679	574.4526	757.0446	772.6849	759.8402 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1768.5214	1725.1701	1557.1831	1266.6909	904.7936	546.0854	311.6815	298.2044	607.2386	1009.3743	1403.7408	1730.9752 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating	714.3436	561.5361	429.6502	198.6400	63.8437	0.0000	0.0000	0.0000	0.0000	187.7333	454.3602	722.5245 (98)
Space heating per m2												3332.6316 (98)
(98) / (4) = 29.4558 (99)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													3674.3458	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	714.3436	561.5361	429.6502	198.6400	63.8437	0.0000	0.0000	0.0000	0.0000	187.7333	454.3602	722.5245	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	787.5895	619.1136	473.7047	219.0077	70.3900	0.0000	0.0000	0.0000	0.0000	206.9827	500.9484	796.6091	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589	(64)	
Efficiency of water heater (217)m	90.0894	90.0345	89.8650	89.4427	88.7082	87.9000	87.9000	87.9000	87.9000	89.3779	89.9060	90.1077	(217)	
Fuel for water heating, kWh/month	214.3317	188.4445	196.8959	175.4004	171.8831	152.9332	144.9220	161.7271	162.2948	182.1036	193.8453	208.4826	(219)	
Water heating fuel used												2153.2644	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3674.3458	(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)													440.6689	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 1.28 * 966 * 1.00) =										-988.9667			-988.9667	(233)
Total delivered energy for all uses													5354.3124	(238)

10a. Fuel costs - using BEDF prices (486)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3674.3458	3.7400	137.4205 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2153.2644	3.7400	80.5321 (247)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	440.6689	19.1200	84.2559 (250)
Additional standing charges			94.0000 (251)
Energy saving/generation technologies			
PV Unit	-988.9667	19.1200	-189.0904 (252)
Total energy cost			221.4581 (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	3674.3458	0.2160	793.6587 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2153.2644	0.2160	465.1051 (264)
Space and water heating			1258.7638 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	440.6689	0.5190	228.7072 (268)
Energy saving/generation technologies			
PV Unit	-988.9667	0.5190	-513.2737 (269)
Total kg/year			1013.1223 (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	3674.3458	1.2200	4482.7018 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2153.2644	1.2200	2626.9826 (264)
Space and water heating			7109.6844 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	440.6689	3.0700	1352.8535 (268)
Energy saving/generation technologies			
PV Unit	-988.9667	3.0700	-3036.1277 (269)
Primary energy kWh/year			5656.6602 (272)
Primary energy kWh/m2/year			49.9970 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 88
Current environmental impact rating: B 89

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.0	-£ 29	-197 kg (19.4%)

		Typical annual savings	Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£29	1.74 kg/m²	B 90	B 91
Total Savings	£29	1.74 kg/m²		
Potential energy efficiency rating:			B 90	
Potential environmental impact rating:				B 91

Fuel prices for cost data on this page from database revision number 486 TEST (30 Nov 2021)
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	£99	£108	-£10
Mains gas	£312	£273	£39
Space heating	£246	£246	£0
Water heating	£81	£52	£29
Lighting	£84	£84	£0
Generated (PV)	-£189	-£189	£0
Total cost of fuels	£222	£192	£29
Total cost of uses	£222	£193	£29
Delivered energy	47 kWh/m²	39 kWh/m²	9 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.8 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	50 kWh/m²	40 kWh/m²	10 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	56.5700 (1b)	x 2.3900 (2b)	= 135.2023 (1b) - (3b)
First floor	56.5700 (1c)	x 2.6700 (2c)	= 151.0419 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.2442 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3372 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3372 (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	0.4300	0.4216	0.4131	0.3710	0.3625	0.3204	0.3204	0.3119	0.3372	0.3625	0.3794	0.3963 (22b)
Effective ac	0.5924	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.5700	0.1200	6.7884	84.0000	4751.8800 (28a)
Brick and Block	156.3500	23.4800	132.8700	0.2400	31.8888	42.2200	5609.7714 (29a)
Pitched Roof	56.5700		56.5700	0.1000	5.6570	9.1000	514.7870 (30)
Total net area of external elements Aum(A, m ²)			269.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.1242		(33)
GF Block			75.2700			75.0000	5645.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			119.6500			9.0000	1076.8500 (32c)
Internal Floor 1			56.5700			18.0000	1018.2600 (32d)
Internal Ceiling 1			56.5700			18.0000	1018.2600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19913.2484 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 176.0054 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5252 (36)
Total fabric heat loss (33) + (36) = 78.6494 (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	55.9624	55.6234	55.2910	53.7299	53.4378	52.0781	52.0781	51.8263	52.6019	53.4378	54.0287	54.6464 (38)
Heat transfer coeff	134.6119	134.2728	133.9404	132.3793	132.0872	130.7275	130.7275	130.4757	131.2513	132.0872	132.6781	133.2958 (39)
Average = Sum(39)m / 12 =												132.3779 (39)
HLP	1.1898	1.1868	1.1838	1.1700	1.1675	1.1554	1.1554	1.1532	1.1601	1.1675	1.1727	1.1781 (40)
HLP (average)												1.1700 (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												2.8324 (42)
Average daily hot water use (litres/day)												101.4699 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.6169	107.5581	103.4993	99.4405	95.3817	91.3229	91.3229	95.3817	99.4405	103.4993	107.5581	111.6169 (44)
Energy conte	165.5246	144.7689	149.3885	130.2406	124.9689	107.8387	99.9284	114.6693	116.0388	135.2320	147.6163	160.3018 (45)
Energy content (annual)										Total = Sum(45)m =		1596.5168 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	24.8287	21.7153	22.4083	19.5361	18.7453	16.1758	14.9893	17.2004	17.4058	20.2848	22.1424	24.0453 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589 (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												1.1360 (H8)
Utilisation factor												0.5853 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												101.4699 (H14)
Volume ratio Veff/V												0.7391 (H15)
Solar storage volume factor												0.9395 (H16)
Solar input												-877.0074 (H17)
Solar input	-25.4315	-42.4378	-72.2764	-96.8647	-119.6681	-117.6528	-116.0980	-101.4354	-79.4443	-54.2511	-30.1654	-21.2818 (63)
Solar input (sum of months) = Sum (63)m =												-877.0074 (63)
Output from w/h	167.6586	127.2273	104.6641	60.0182	32.8063	16.7754	11.2884	40.7227	63.2129	108.5093	144.1132	166.5771 (64)
Total per year (kWh/year) = Sum (64)m =												1043.5737 (64)
Heat gains from water heating, kWh/month	61.9283	54.3597	56.5597	49.9656	48.4286	42.5038	40.0907	44.9998	45.2375	51.8467	55.7480	60.1896 (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	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.3812	55.4065	45.0596	34.1130	25.4999	21.5281	23.2618	30.2366	40.5835	51.5301	60.1432	64.1150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	411.9289	416.2034	405.4317	382.5001	353.5530	326.3468	308.1715	303.8969	314.6686	337.6002	366.5473	393.7535	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	(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)	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	(71)
Water heating gains (Table 5)	83.2370	80.8924	76.0211	69.3966	65.0921	59.0330	53.8854	60.4835	62.8298	69.6865	77.4278	80.9000	(72)
Total internal gains	672.0224	666.9776	640.9877	600.4850	558.6203	521.3832	499.7939	509.0923	532.5572	573.2921	618.5936	653.2438	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North					2.8800	10.6334		0.6300	0.7000	0.7700	9.3591 (74)	
East					8.8900	19.6403		0.6300	0.7000	0.7700	53.3606 (76)	
South					0.9600	46.7521		0.6300	0.7000	0.7700	13.7165 (78)	
West					8.6300	19.6403		0.6300	0.7000	0.7700	51.8000 (80)	

Solar gains	128.2363	246.0665	397.7935	575.2583	705.0008	722.7085	687.5631	589.8481	460.4555	289.6204	158.9274	106.1336 (83)
Total gains	800.2587	913.0440	1038.7811	1175.7433	1263.6211	1244.0916	1187.3570	1098.9404	993.0127	862.9124	777.5210	759.3774 (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	41.0919	41.1957	41.2979	41.7849	41.8773	42.3129	42.3129	42.3945	42.1440	41.8773	41.6908	41.4976
alpha	3.7395	3.7464	3.7532	3.7857	3.7918	3.8209	3.8209	3.8263	3.8096	3.7918	3.7794	3.7665
util living area	0.9864	0.9767	0.9532	0.8932	0.7800	0.6158	0.4683	0.5203	0.7541	0.9285	0.9775	0.9887 (86)
MIT	19.4341	19.6357	19.9766	20.4051	20.7380	20.9236	20.9792	20.9692	20.8305	20.3822	19.8314	19.3976 (87)
Th 2	19.9282	19.9306	19.9329	19.9440	19.9461	19.9558	19.9558	19.9576	19.9521	19.9461	19.9419	19.9375 (88)
util rest of house	0.9831	0.9713	0.9420	0.8675	0.7289	0.5336	0.3642	0.4132	0.6806	0.9056	0.9713	0.9860 (89)
MIT 2	18.5144	18.7152	19.0507	19.4673	19.7647	19.9165	19.9491	19.9467	19.8524	19.4572	18.9194	18.4854 (90)
Living area fraction									fLA = Living area / (4) =			0.1214 (91)
MIT	18.6261	18.8270	19.1631	19.5812	19.8829	20.0388	20.0742	20.0709	19.9712	19.5695	19.0302	18.5962 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6261	18.8270	19.1631	19.5812	19.8829	20.0388	20.0742	20.0709	19.9712	19.5695	19.0302	18.5962 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9778	0.9639	0.9318	0.8571	0.7255	0.5405	0.3764	0.4254	0.6821	0.8954	0.9642	0.9814	(94)
Useful gains	782.5260	880.0986	967.9664	1007.7447	916.8052	672.4792	446.9706	467.4886	677.3761	772.6913	749.6469	745.2346	(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	1928.4659	1870.0176	1696.1036	1413.9634	1080.8564	711.0025	454.1720	478.9599	770.5995	1184.7626	1582.8762	1918.9524	(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	852.5793	665.2256	541.7341	292.4775	122.0540	0.0000	0.0000	0.0000	0.0000	306.5810	599.9251	873.2461	(98)
Space heating												4253.8228	(98)
Space heating per m2											(98) / (4) =	37.5979	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													4689.9920	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	852.5793	665.2256	541.7341	292.4775	122.0540	0.0000	0.0000	0.0000	0.0000	306.5810	599.9251	873.2461	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	939.9992	733.4351	597.2813	322.4669	134.5690	0.0000	0.0000	0.0000	0.0000	338.0165	661.4389	962.7851	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	167.6586	127.2273	104.6641	60.0182	32.8063	16.7754	11.2884	40.7227	63.2129	108.5093	144.1132	166.5771	(64)	
Efficiency of water heater	90.2277	90.2385	90.2346	90.2107	90.0920	87.9000	87.9000	87.9000	87.9000	89.9510	90.1438	90.2395	(216)	
Fuel for water heating, kWh/month	185.8173	140.9900	115.9911	66.5312	36.4143	19.0847	12.8424	46.3285	71.9145	120.6316	159.8703	184.5945	(219)	
Water heating fuel used												1161.0102	(219)	
Annual totals kWh/year														
Space heating fuel - main system												4689.9920	(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)												440.6689	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 1.28 * 853 * 1.00) =												-873.5026	(233)	
Total delivered energy for all uses												5543.1685	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4689.9920	3.4800	163.2117 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1161.0102	3.4800	40.4032 (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	440.6689	13.1900	58.1242 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-873.5026	13.1900	-115.2150 (252)
Total energy cost			283.0116 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7516 (257)
SAP value		89.5146
SAP rating (Section 12)		90 (258)
SAP band		B

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4689.9920	0.2160	1013.0383 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1161.0102	0.2160	250.7782 (264)
Space and water heating			1263.8165 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	440.6689	0.5190	228.7072 (268)
Energy saving/generation technologies			
PV Unit	-873.5026	0.5190	-453.3479 (269)
Total kg/year			1104.0508 (272)
CO2 emissions per m2			9.7600 (273)
EI value			90.6448
EI rating			91 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (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	56.5700 (1b)	x 2.3900 (2b)	= 135.2023 (1b) - (3b)
First floor	56.5700 (1c)	x 2.6700 (2c)	= 151.0419 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.2442 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1397 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3372 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3372 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.3963	0.3710	0.3710	0.3372	0.3457	0.3288	0.3288	0.3204	0.3204	0.3457	0.3372	0.3457 (22b)
Effective ac	0.5785	0.5688	0.5688	0.5569	0.5597	0.5541	0.5541	0.5513	0.5513	0.5597	0.5569	0.5597 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			21.3600	1.1450	24.4580		(27)
Ground Floor			56.5700	0.1200	6.7884	84.0000	4751.8800 (28a)
Brick and Block	156.3500	23.4800	132.8700	0.2400	31.8888	42.2200	5609.7714 (29a)
Pitched Roof	56.5700		56.5700	0.1000	5.6570	9.1000	514.7870 (30)
Total net area of external elements Aum(A, m ²)			269.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.1242		(33)
GF Block			75.2700			75.0000	5645.2500 (32c)
GF Stud			30.9100			9.0000	278.1900 (32c)
FF Stud			119.6500			9.0000	1076.8500 (32c)
Internal Floor 1			56.5700			18.0000	1018.2600 (32d)
Internal Ceiling 1			56.5700			18.0000	1018.2600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19913.2484 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							176.0054 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5252 (36)
Total fabric heat loss						(33) + (36) =	78.6494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	54.6464	53.7299	53.7299	52.6019	52.8738	52.3366	52.3366	52.0781	52.0781	52.8738	52.6019	52.8738 (38)
Heat transfer coeff	133.2958	132.3793	132.3793	131.2513	131.5232	130.9860	130.9860	130.7275	130.7275	131.5232	131.2513	131.5232 (39)
Average = Sum(39)m / 12 =												131.5461 (39)

HLP	1.1781	1.1700	1.1700	1.1601	1.1625	1.1577	1.1577	1.1554	1.1554	1.1625	1.1601	1.1625 (40)
HLP (average)												1.1627 (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												2.8324 (42)
Average daily hot water use (litres/day)												101.4699 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.6169	107.5581	103.4993	99.4405	95.3817	91.3229	91.3229	95.3817	99.4405	103.4993	107.5581	111.6169 (44)
Energy conte	165.5246	144.7689	149.3885	130.2406	124.9689	107.8387	99.9284	114.6693	116.0388	135.2320	147.6163	160.3018 (45)
Energy content (annual)										Total = Sum(45)m =		1596.5168 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	24.8287	21.7153	22.4083	19.5361	18.7453	16.1758	14.9893	17.2004	17.4058	20.2848	22.1424	24.0453 (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	27.5654	24.8962	27.5520	26.6424	27.5056	26.5896	27.4581	27.4889	26.6184	27.5284	26.6623	27.5572 (61)
Total heat required for water heating calculated for each month	193.0901	169.6651	176.9405	156.8829	152.4745	134.4283	127.3865	142.1582	142.6572	162.7604	174.2786	187.8589 (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												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2691 (H8)
Utilisation factor												0.5452 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												101.4699 (H14)
Volume ratio Veff/V												0.7391 (H15)
Solar storage volume factor												0.9395 (H16)
Solar input												-912.6331 (H17)
Solar input	-29.7804	-42.3510	-73.4900	-98.8564	-114.8778	-124.9537	-118.4752	-108.0379	-84.5610	-58.4456	-35.2234	-23.5806 (63)
Solar input (sum of months) = Sum (63)m =												-912.6331 (63)
Output from w/h	163.3097	127.3140	103.4506	58.0265	37.5967	9.4745	8.9113	34.1202	58.0961	104.3148	139.0552	164.2784 (64)
Total per year (kWh/year) = Sum (64)m =												1007.9480 (64)
Heat gains from water heating, kWh/month	61.9283	54.3597	56.5597	49.9656	48.4286	42.5038	40.0907	44.9998	45.2375	51.8467	55.7480	60.1896 (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	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	169.9450	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.3812	55.4065	45.0596	34.1130	25.4999	21.5281	23.2618	30.2366	40.5835	51.5301	60.1432	64.1150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	411.9289	416.2034	405.4317	382.5001	353.5530	326.3468	308.1715	303.8969	314.6686	337.6002	366.5473	393.7535	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	54.8269	(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)	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	-113.2967	(71)
Water heating gains (Table 5)	83.2370	80.8924	76.0211	69.3966	65.0921	59.0330	53.8854	60.4835	62.8298	69.6865	77.4278	80.9000	(72)
Total internal gains	672.0224	666.9776	640.9877	600.4850	558.6203	521.3832	499.7939	509.0923	532.5572	573.2921	618.5936	653.2438	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.8800	13.4684	0.6300	0.7000	0.7700	11.8544 (74)
East	8.8900	25.1733	0.6300	0.7000	0.7700	68.3932 (76)
South	0.9600	56.5862	0.6300	0.7000	0.7700	16.6017 (78)
West	8.6300	25.1733	0.6300	0.7000	0.7700	66.3930 (80)

Solar gains	163.2423	266.8689	438.8908	635.3264	730.6818	827.8187	757.0730	679.1713	531.2862	338.9397	201.7330	127.8340 (83)
Total gains	835.2647	933.8464	1079.8785	1235.8114	1289.3021	1349.2018	1256.8669	1188.2636	1063.8434	912.2317	820.3266	781.0778 (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	41.4976	41.7849	41.7849	42.1440	42.0569	42.2294	42.2294	42.3129	42.3129	42.0569	42.1440	42.0569
alpha	3.7665	3.7857	3.7857	3.8096	3.8038	3.8153	3.8153	3.8209	3.8209	3.8038	3.8096	3.8038
util living area												
	0.9797	0.9687	0.9341	0.8457	0.6992	0.4774	0.3400	0.3478	0.6265	0.8776	0.9621	0.9831 (86)
MIT	19.6712	19.8341	20.1748	20.5833	20.8514	20.9742	20.9947	20.9945	20.9291	20.6002	20.0938	19.6555 (87)
Th 2	19.9375	19.9440	19.9440	19.9521	19.9501	19.9540	19.9540	19.9558	19.9558	19.9501	19.9521	19.9501 (88)
util rest of house												
	0.9746	0.9611	0.9180	0.8096	0.6332	0.3867	0.2342	0.2364	0.5312	0.8378	0.9510	0.9788 (89)
MIT 2	18.7566	18.9212	19.2508	19.6358	19.8588	19.9439	19.9530	19.9549	19.9229	19.6604	19.1847	18.7512 (90)
Living area fraction									fLA = Living area / (4) =			0.1214 (91)
MIT	18.8676	19.0320	19.3630	19.7509	19.9793	20.0690	20.0795	20.0811	20.0451	19.7745	19.2951	18.8610 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8676	19.0320	19.3630	19.7509	19.9793	20.0690	20.0795	20.0811	20.0451	19.7745	19.2951	18.8610 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9678	0.9526	0.9072	0.8017	0.6352	0.3970	0.2471	0.2500	0.5400	0.8299	0.9419	0.9728	(94)
Useful gains	808.3821	889.5510	979.6963	990.8021	818.9822	535.6415	310.5333	297.0679	574.4526	757.0446	772.6849	759.8402	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W													
	1768.5214	1725.1701	1557.1831	1266.6909	904.7936	546.0854	311.6815	298.2044	607.2386	1009.3743	1403.7408	1730.9752	(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													
	714.3436	561.5361	429.6502	198.6400	63.8437	0.0000	0.0000	0.0000	0.0000	187.7333	454.3602	722.5245	(98)
Space heating													3332.6316 (98)
Space heating per m2													(98) / (4) = 29.4558 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3674.3458 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	714.3436	561.5361	429.6502	198.6400	63.8437	0.0000	0.0000	0.0000	0.0000	187.7333	454.3602	722.5245	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	787.5895	619.1136	473.7047	219.0077	70.3900	0.0000	0.0000	0.0000	0.0000	206.9827	500.9484	796.6091	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	163.3097	127.3140	103.4506	58.0265	37.5967	9.4745	8.9113	34.1202	58.0961	104.3148	139.0552	164.2784	(64)
Efficiency of water heater	90.1656	90.1691	90.1428	90.0515	89.6417	87.9000	87.9000	87.9000	87.9000	89.6796	90.0280	90.1679	(216)
(217)m	181.1220	141.1947	114.7630	64.4370	41.9411	10.7788	10.1379	38.8171	66.0934	116.3194	154.4577	182.1916	(219)
Fuel for water heating, kWh/month												1122.2538	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system												3674.3458	(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)												440.6689	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.28 * 966 * 1.00) =									-988.9667			-988.9667	(233)
Total delivered energy for all uses												4373.3018	(238)

10a. Fuel costs - using BEDF prices (486)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3674.3458	3.7400	137.4205 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1122.2538	3.7400	41.9723 (247)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Pump for solar water heating	50.0000	19.1200	9.5600 (249)
Energy for lighting	440.6689	19.1200	84.2559 (250)
Additional standing charges			94.0000 (251)
Energy saving/generation technologies			
PV Unit	-988.9667	19.1200	-189.0904 (252)
Total energy cost			192.4583 (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	3674.3458	0.2160	793.6587 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1122.2538	0.2160	242.4068 (264)
Space and water heating			1036.0655 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	440.6689	0.5190	228.7072 (268)
Energy saving/generation technologies			
PV Unit	-988.9667	0.5190	-513.2737 (269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Total kg/year

816.3740 (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	3674.3458	1.2200	4482.7018 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1122.2538	1.2200	1369.1496 (264)
Space and water heating			5851.8515 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	440.6689	3.0700	1352.8535 (268)
Energy saving/generation technologies			
PV Unit	-988.9667	3.0700	-3036.1277 (269)
Primary energy kWh/year			4552.3273 (272)
Primary energy kWh/m2/year			40.2362 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 9	Issued on Date	17/12/2021
Assessment Reference	As Built	Prop Type Ref	Eh
Project	9 Oram Way, West End, Southampton, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.08	TER	17.73
Environmental	89 B	% DER<TER	26.24		
CO ₂ Emissions (t/year)	1.01	DFEE	47.60	TREE	58.55
General Requirements Compliance	Pass	% DFEE<TFEE	18.70		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Earthwool Loft Roll 40						
	Main construction	150	0.0400	3.7500	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Earthwool Loft Roll 40						
	Main construction	200	0.0400	5.0000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Earthwool Loft Roll 40						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 11.200 m ² K/W	Lower limit = 10.901 m ² K/W	Average = 11.050 m ² K/W
	Total correction = 0.0065 m ² K/W	U-value (unrounded) = 0.1 W/m ² K	

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 9	Issued on Date	17/12/2021
Assessment Reference	As Built	Prop Type Ref	Eh
Project	9 Oram Way, West End, Southampton, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.08	TER	17.73
Environmental	89 B	% DER<TER	26.24		
CO ₂ Emissions (t/year)	1.01	DFEE	47.60	TFEE	58.55
General Requirements Compliance	Pass	% DFEE<TFEE	18.70		

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

Wall 000001

Wall Type: Standard Wall

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

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

Unheated space: None

Total thickness: 330 mm

U-value: 0.24 W/m² K

Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 9	Issued on Date	17/12/2021
Assessment Reference	As Built	Prop Type Ref	Eh
Project	9 Oram Way, West End, Southampton, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.08	TER	17.73
Environmental	89 B	% DER<TER	26.24		
CO ₂ Emissions (t/year)	1.01	DFEE	47.60	TFEE	58.55
General Requirements Compliance	Pass	% DFEE<TFEE	18.70		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 56.57 m², Perimeter = 30.90 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 9	Issued on Date	17/12/2021
Assessment Reference	As Built	Prop Type Ref	Eh
Property	9 Oram Way, West End, Southampton, SO30 3JW		

SAP Rating	88 B	DER	13.08	TER	17.73
Environmental	89 B	% DER<TER	26.24		
CO ₂ Emissions (t/year)	1.01	DFEE	47.60	TFEE	58.55
General Requirements Compliance	Pass	% DFEE<TFEE	18.70		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	30.90 m	56.57 m ²	2.39 m
	1st Storey:	30.90 m	56.57 m ²	2.67 m

7.0 Living Area	13.74	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	176.01	kJ/m²K

9.0 External Walls			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	156.35	132.87

9.1 Party Walls			U-Value	Kappa	Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)
		Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill		70.00	

9.2 Internal Walls			Kappa	Area
Description	Construction		(kJ/m ² K)	(m ²)
GF Block	Dense block, plasterboard on dabs		75.00	75.27
GF Stud	Plasterboard on timber frame		9.00	30.91
FF Stud	Plasterboard on timber frame		9.00	119.65

10.0 External Roofs			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	56.57	56.57

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	56.57

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	56.57

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	56.57

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.12	
Front Shaded	Window	[1] Brick and Block	East	None	0.77	Yes				1.86	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					7.03	
Side Elevation	Window	[1] Brick and Block	North	None	0.00					2.88	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					8.63	
Side Elevation	Window	[1] Brick and Block	South	None	0.00					0.96	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	18.40	0.053	No	CD0025
Independently assessed	E3 Sill	15.88	0.034	No	CD0027
Independently assessed	E4 Jamb	37.80	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	30.90	0.060	No	CBA - 302
Independently assessed	E6 Intermediate floor within a dwelling	30.90	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	13.89	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	16.93	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	25.25	0.050	No	CD0035
Independently assessed	E17 Corner (inverted – internal area greater than external area)	5.05	-0.065	No	CD0036

Y-value 0.028 W/m²K

18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	5.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	Yes	
	3.95	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather Windows half open

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	23	
Total number of L.E.L. fittings	23	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17515	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.7	
Controls	87.9	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
Fan Assisted Flue	Balanced	
Is MHS Pumped	Yes	
Heat Emitter	Pump in heated space	
Flow Temperature	Radiators	
Combi boiler type	Normal (> 45°C)	
Combi keep hot type	Standard Combi	
	Gas/Oil, time clock	

25.0 Main Heating 2

None

Community Heating	None
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SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

28.0 Water Heating

	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901

29.0 Hot Water Cylinder

None

32.0 Photovoltaic Unit

One Dwelling

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.28	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	£29	B 90	