



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 14 Oram Way, West End
SOUTHAMPTON, SO30 3JW

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 26/07/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 13	Issued on Date	26/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Property	14 Oram Way, West End, SOUTHAMPTON, SO30 3JW		
SAP Rating	89 B	DER	12.45
Environmental	88 B	TER	15.91
CO ₂ Emissions (t/year)	1.44	% DER<TER	21.73
General Requirements Compliance	Pass	DFEE	45.72
		TFEE	57.52
		% DFEE<TFEE	20.52
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As 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)	15.91	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.45	kgCO ₂ /m ²	Pass
	-3.46 (-21.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.52	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.72	kWh/m ² /yr	
	-11.8 (-20.5%)	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	4.31 (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 4000 GR4700iW 18 S NG

Efficiency: 89.5% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.73 kWh/day
Permitted by DBSCG 2.33

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

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

16.84 m², No overhang

Windows facing East

2.17 m², No overhang

Windows facing South

9.54 m², Overhang twice as wide as window, ratio 1.17

Windows facing West

0.96 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

4.31 (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	0.016	W/m ² K
Photovoltaic array	0.97	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Environmental	88 B	% DER<TER	21.73		
CO ₂ Emissions (t/year)	1.44	DFEE	45.72	TFEE	57.52
General Requirements Compliance	Pass	% DFEE<TFEE	20.52		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	2.52	0.19	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	9.15	0.64	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.54	0.23	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.056	5.54	0.31	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	15.22	0.32	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	50.10	0.80	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.022	40.55	0.89	Knauf P10 Average Value
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	40.55	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	25.65	1.54	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	15.01	0.66	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	30.30	1.18	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	10.10	-0.92	Knauf P24

Total: **5.92** W/mK:
Y-Value: **0.016** W/m²K:

FULL SAP CALCULATION PRINTOUT

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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 157 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) 15.91 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.45 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.7 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: 4.31 (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 4000 GR4700iW 18 S NG

Efficiency: 89.5% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.73 kWh/day
Permitted by DBSCG 2.33 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

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: 16.84 m², No overhang
Windows facing East: 2.17 m², No overhang
Windows facing South: 9.54 m², Overhang twice as wide as window, ratio 1.17
Windows facing West: 0.96 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.016 W/m²K
Photovoltaic array 0.97 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	78.3700 (1b)	x 2.3900 (2b)	= 187.3043 (1b) - (3b)
First floor	78.3700 (1c)	x 2.6700 (2c)	= 209.2479 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.5522 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1261 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3416 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2903 (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	0.3702	0.3629	0.3557	0.3194	0.3121	0.2758	0.2758	0.2686	0.2903	0.3121	0.3266	0.3412 (22b)
Effective ac	0.5685	0.5659	0.5633	0.5510	0.5487	0.5380	0.5380	0.5361	0.5422	0.5487	0.5533	0.5582 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.3700	0.1200	9.4044	84.0000	6583.0800 (28a)
Brick and Block	205.1800	31.6300	173.5500	0.2400	41.6520	42.2200	7327.2810 (29a)
Pitched Roof	78.3700		78.3700	0.1000	7.8370	9.1000	713.1670 (30)
Total net area of external elements Aum(A, m ²)			361.9200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0155		(33)
GF Block			76.3200			75.0000	5724.0000 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			176.4600			9.0000	1588.1400 (32c)
Internal Floor 1			78.3700			18.0000	1410.6600 (32d)
Internal Ceiling 1			78.3700			18.0000	1410.6600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25003.8580 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.5244 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9191 (36)
Total fabric heat loss (33) + (36) = 100.9346 (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	74.3981	74.0499	73.7086	72.1055	71.8055	70.4093	70.4093	70.1507	70.9471	71.8055	72.4123	73.0466 (38)
Heat transfer coeff	175.3327	174.9845	174.6432	173.0401	172.7401	171.3439	171.3439	171.0853	171.8817	172.7401	173.3469	173.9812 (39)
Average = Sum(39)m / 12 =												173.0386 (39)
HLP	1.1186	1.1164	1.1142	1.1040	1.1021	1.0932	1.0932	1.0915	1.0966	1.1021	1.1060	1.1100 (40)
HLP (average)												1.1040 (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												2.9443 (42)
Average daily hot water use (litres/day)												104.1264 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5390	110.3740	106.2089	102.0439	97.8788	93.7138	93.7138	97.8788	102.0439	106.2089	110.3740	114.5390 (44)
Energy conte	169.8581	148.5590	153.2996	133.6503	128.2406	110.6619	102.5445	117.6713	119.0767	138.7724	151.4809	164.4985 (45)
Energy content (annual)										Total = Sum(45)m =		1638.3138 (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	25.4787	22.2838	22.9949	20.0475	19.2361	16.5993	15.3817	17.6507	17.8615	20.8159	22.7221	24.6748 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
222.0807 195.7278 205.5222 184.1883 180.4632 161.1999 154.7671 169.8939 169.6147 190.9950 202.0189 216.7211 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	222.0807	195.7278	205.5222	184.1883	180.4632	161.1999	154.7671	169.8939	169.6147	190.9950	202.0189	216.7211 (64)
Total per year (kWh/year) = Sum(64)m =												2253.1928 (64)
Heat gains from water heating, kWh/month												
98.2559 87.1309 92.7502 84.8691 84.4181 77.2255 75.8741 80.9038 80.0234 87.9199 90.7978 96.4738 (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 147.2135 147.2135 147.2135 147.2135 147.2135 147.2135 147.2135 147.2135 147.2135 147.2135 147.2135 147.2135 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
29.6443 26.3298 21.4129 16.2109 12.1178 10.2304 11.0543 14.3688 19.2858 24.4877 28.5808 30.4682 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
327.7625 331.1637 322.5929 304.3467 281.3141 259.6668 245.2051 241.8039 250.3747 268.6209 291.6534 313.3008 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.7213 37.7213 37.7213 37.7213 37.7213 37.7213 37.7213 37.7213 37.7213 37.7213 37.7213 37.7213 (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)												
-117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 (71)												
Water heating gains (Table 5)												
132.0644 129.6591 124.6642 117.8738 113.4652 107.2576 101.9814 108.7417 111.1436 118.1719 126.1081 129.6691 (72)												
Total internal gains	559.6353	557.3166	538.8340	508.5954	477.0612	447.3189	428.4048	435.0784	450.9681	481.4446	516.5063	543.6022 (73)

6. Solar gains

[Jan]	Area	Solar flux	Specific data	Specific data	Access	Gains
	m2	Table 6a	g	FF	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	16.8400	10.6334	0.6300	0.7000	0.7700	54.7250 (74)
East	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (76)
South	9.5400	46.7521	0.6300	0.7000	0.7700	136.3079 (78)
West	0.9600	19.6403	0.6300	0.7000	0.7700	5.7622 (80)

Solar gains	209.8201	364.5713	522.6005	695.1151	827.6192	844.6965	804.6700	701.3017	581.1116	408.8830	252.5072	178.8538 (83)
Total gains	769.4554	921.8879	1061.4345	1203.7105	1304.6804	1292.0153	1233.0748	1136.3801	1032.0797	890.3276	769.0135	722.4559 (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 39.6134 39.6922 39.7698 40.1382 40.2079 40.5355 40.5355 40.5968 40.4087 40.2079 40.0671 39.9211												
alpha 3.6409 3.6461 3.6513 3.6759 3.6805 3.7024 3.7024 3.7065 3.6939 3.6805 3.6711 3.6614												
util living area 0.9943 0.9885 0.9753 0.9399 0.8597 0.7186 0.5688 0.6262 0.8380 0.9604 0.9897 0.9955 (86)												
MIT 19.1699 19.3865 19.7319 20.1827 20.5880 20.8568 20.9552 20.9358 20.7267 20.2001 19.6007 19.1314 (87)												
Th 2 19.9857 19.9875 19.9892 19.9976 19.9991 20.0064 20.0064 20.0078 20.0036 19.9991 19.9960 19.9927 (88)												
util rest of house 0.9930 0.9859 0.9693 0.9245 0.8217 0.6421 0.4572 0.5158 0.7802 0.9474 0.9869 0.9945 (89)												
MIT 2 17.5244 17.8409 18.3431 18.9931 19.5493 19.8858 19.9816 19.9689 19.7426 19.0282 18.1602 17.4725 (90)												
Living area fraction fLA = Living area / (4) =												0.1786 (91)
MIT 17.8183 18.1169 18.5911 19.2055 19.7348 20.0592 20.1555 20.1416 19.9183 19.2375 18.4175 17.7687 (92)												
Temperature adjustment 0.0000												
adjusted MIT 17.8183 18.1169 18.5911 19.2055 19.7348 20.0592 20.1555 20.1416 19.9183 19.2375 18.4175 17.7687 (93)												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9887	0.9787	0.9579	0.9089	0.8100	0.6466	0.4750	0.5319	0.7744	0.9338	0.9802	0.9909 (94)
Ext temp.	760.7632	902.2330	1016.7768	1094.0023	1056.7500	835.4114	585.7046	604.4221	799.2286	831.3811	753.8016	715.8628 (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	2370.1946	2312.7500	2111.6230	1783.2684	1387.9258	935.3937	609.2109	640.1305	1000.0619	1492.0436	1961.8458	2360.7054 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	1197.4170	947.8675	814.5656	496.2716	246.3948	0.0000	0.0000	0.0000	0.0000	491.5329	869.7918	1223.7629 (98)
												6287.6040 (98)
												(98) / (4) = 40.1149 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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 %)																90.5000 (206)
Efficiency of secondary/supplementary heating system, %																0.0000 (208)
Space heating requirement																6947.6287 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Space heating requirement	1197.4170	947.8675	814.5656	496.2716	246.3948	0.0000	0.0000	0.0000	0.0000	491.5329	869.7918	1223.7629	(98)			
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)			
Space heating fuel (main heating system)	1323.1127	1047.3674	900.0725	548.3664	272.2594	0.0000	0.0000	0.0000	0.0000	543.1303	961.0960	1352.2242	(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	222.0807	195.7278	205.5222	184.1883	180.4632	161.1999	154.7671	169.8939	169.6147	190.9950	202.0189	216.7211	(64)			
Efficiency of water heater (217)m	88.6405	88.4697	88.1195	87.3304	85.6450	79.8000	79.8000	79.8000	79.8000	87.2271	88.2692	88.7104	(216)			
Fuel for water heating, kWh/month	250.5408	221.2370	233.2313	210.9097	210.7107	202.0049	193.9438	212.8997	212.5497	218.9630	228.8669	244.3017	(219)			
Water heating fuel used												2640.1591	(219)			
Annual totals kWh/year																
Space heating fuel - main system												6947.6287	(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)												523.5279	(232)			
Energy saving/generation technologies (Appendices M,N and Q)																
PV Unit 0 (0.80 + 0.97 + 1068 + 1.00) =										-828.8227		-828.8227	(233)			
Total delivered energy for all uses												9357.4931	(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	6947.6287	0.2160	1500.6878	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2640.1591	0.2160	570.2744	(264)
Space and water heating			2070.9622	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	523.5279	0.5190	271.7110	(268)
Energy saving/generation technologies				
PV Unit	-828.8227	0.5190	-430.1590	(269)
Total CO2, kg/year			1951.4392	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.4500	(273)

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

DER			12.4500	ZC1
Total Floor Area		TFA	156.7400	
Assumed number of occupants		N	2.9443	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			12.3916	ZC2
CO2 emissions from cooking, equation (L16)			1.2100	ZC3
Total CO2 emissions			26.0516	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			26.0516	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.3700 (1b)	x 2.3900 (2b)	= 187.3043 (1b) - (3b)
First floor	78.3700 (1c)	x 2.6700 (2c)	= 209.2479 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.5522 (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) =							0.1009 (8)
Pressure test										Yes							
Measured/design AP50																	5.0000
Infiltration rate																	0.3509 (18)
Number of sides sheltered																	2 (19)
Shelter factor										(20) = 1 - [0.075 x (19)] =							0.8500 (20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =							0.2982 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind factor	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)				
Adj infilt rate	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)				
	0.3803	0.3728	0.3653	0.3281	0.3206	0.2833	0.2833	0.2759	0.2982	0.3206	0.3355	0.3504	(22b)				
Effective ac	0.5723	0.5695	0.5667	0.5538	0.5514	0.5401	0.5401	0.5381	0.5445	0.5514	0.5563	0.5614	(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)			29.5100	1.3258	39.1231		(27)					
Ground Floor			78.3700	0.1300	10.1881		(28a)					
Brick and Block	205.1800	31.6300	173.5500	0.1800	31.2390		(29a)					
Pitched Roof	78.3700		78.3700	0.1300	10.1881		(30)					
Total net area of external elements Aum(A, m2)			361.9200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	92.8583		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1001 (36)					
Total fabric heat loss						(33) + (36) =	107.9584 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 74.8920	Feb 74.5247	Mar 74.1646	Apr 72.4732	May 72.1567	Jun 70.6835	Jul 70.6835	Aug 70.4107	Sep 71.2510	Oct 72.1567	Nov 72.7969	Dec 73.4662 (38)
Heat transfer coeff	182.8504	182.4831	182.1230	180.4316	180.1151	178.6420	178.6420	178.3691	179.2094	180.1151	180.7553	181.4246 (39)
Average = Sum(39)m / 12 =												180.4300 (39)
HLP	Jan 1.1666	Feb 1.1642	Mar 1.1619	Apr 1.1512	May 1.1491	Jun 1.1397	Jul 1.1397	Aug 1.1380	Sep 1.1434	Oct 1.1491	Nov 1.1532	Dec 1.1575 (40)
HLP (average)												1.1511 (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												2.9443 (42)
Average daily hot water use (litres/day)												104.1264 (43)
Daily hot water use	Jan 114.5390	Feb 110.3740	Mar 106.2089	Apr 102.0439	May 97.8788	Jun 93.7138	Jul 93.7138	Aug 97.8788	Sep 102.0439	Oct 106.2089	Nov 110.3740	Dec 114.5390 (44)
Energy conte	169.8581	148.5590	153.2996	133.6503	128.2406	110.6619	102.5445	117.6713	119.0767	138.7724	151.4809	164.4985 (45)
Energy content (annual)												Total = Sum(45)m = 1638.3138 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.4787	22.2838	22.9949	20.0475	19.2361	16.5993	15.3817	17.6507	17.8615	20.8159	22.7221	24.6748 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7258 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)	0.9319 (55)											
Total storage loss												
28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896	(56)
If cylinder contains dedicated solar storage												
28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
222.0100	195.6640	205.4515	184.1199	180.3926	161.1315	154.6965	169.8233	169.5463	190.9244	201.9506	216.6504	(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	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
222.0100	195.6640	205.4515	184.1199	180.3926	161.1315	154.6965	169.8233	169.5463	190.9244	201.9506	216.6504	(64)
Total per year (kWh/year) = Sum(64)m =												2252.3609 (64)
Heat gains from water heating, kWh/month												
98.1994	87.0798	92.6937	84.8144	84.3616	77.1708	75.8176	80.8473	79.9687	87.8634	90.7431	96.4173	(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	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.6443	26.3298	21.4129	16.2109	12.1178	10.2304	11.0543	14.3688	19.2858	24.4877	28.5808	30.4682	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.7625	331.1637	322.5929	304.3467	281.3141	259.6668	245.2051	241.8039	250.3747	268.6209	291.6534	313.3008	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	(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)	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	(71)
Water heating gains (Table 5)	131.9884	129.5831	124.5883	117.7978	113.3892	107.1816	101.9054	108.6657	111.0676	118.0960	126.0321	129.5932	(72)
Total internal gains	559.5593	557.2406	538.7580	508.5194	476.9852	447.2429	428.3288	435.0024	450.8922	481.3686	516.4304	543.5262	(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					16.8400	10.6334	0.6300	0.7000	0.7700	54.7250 (74)			
East					2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (76)			
South					9.5400	46.7521	0.6300	0.7000	0.7700	136.3079 (78)			
West					0.9600	19.6403	0.6300	0.7000	0.7700	5.7622 (80)			

Solar gains	209.8201	364.5713	522.6005	695.1151	827.6192	844.6965	804.6700	701.3017	581.1116	408.8830	252.5072	178.8538	(83)
Total gains	769.3794	921.8120	1061.3585	1203.6346	1304.6045	1291.9394	1232.9988	1136.3041	1032.0037	890.2516	768.9375	722.3799	(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	59.5280	59.6478	59.7658	60.3260	60.4320	60.9304	60.9304	61.0236	60.7375	60.4320	60.2180	59.9959
alpha	4.9685	4.9765	4.9844	5.0217	5.0288	5.0620	5.0620	5.0682	5.0492	5.0288	5.0145	4.9997
util living area	0.9992	0.9979	0.9936	0.9768	0.9192	0.7802	0.6122	0.6773	0.9002	0.9874	0.9982	0.9994 (86)
MIT	19.6351	19.7939	20.0516	20.3964	20.7148	20.9187	20.9813	20.9695	20.8155	20.4042	19.9551	19.6082 (87)
Th 2	19.9468	19.9487	19.9506	19.9593	19.9609	19.9685	19.9685	19.9699	19.9656	19.9609	19.9576	19.9542 (88)
util rest of house	0.9989	0.9971	0.9912	0.9671	0.8838	0.6917	0.4813	0.5469	0.8423	0.9806	0.9974	0.9992 (89)
MIT 2	18.1160	18.3495	18.7266	19.2298	19.6670	19.9110	19.9612	19.9564	19.8057	19.2472	18.5919	18.0819 (90)
Living area fraction	18.3873	18.6074	18.9633	19.4381	19.8541	20.0909	20.1434	20.1373	19.9860	19.4538	18.8353	18.3544 (91)
MIT	18.3873	18.6074	18.9633	19.4381	19.8541	20.0909	20.1434	20.1373	19.9860	19.4538	18.8353	18.3544 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3873	18.6074	18.9633	19.4381	19.8541	20.0909	20.1434	20.1373	19.9860	19.4538	18.8353	18.3544 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9983	0.9956	0.9878	0.9606	0.8794	0.7034	0.5047	0.5697	0.8437	0.9757	0.9961	0.9987	(94)
Useful gains	768.0460	917.7512	1048.4401	1156.1556	1147.2222	908.7478	622.2712	647.4082	870.6842	868.6408	765.9073	721.4646	(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	2575.8667	2501.3740	2269.8457	1901.4100	1468.6716	980.9128	632.9996	666.6278	1054.8339	1594.7115	2121.2170	2567.9607	(97)
Month fracti	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 kWh	1345.0186	1064.1946	908.7257	536.5832	239.1584	0.0000	0.0000	0.0000	0.0000	540.1966	975.8230	1373.7931	(98)
Space heating													6983.4931 (98)
Space heating per m2													44.5546 (99)
													(98) / (4) =

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7468.9766 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1345.0186	1064.1946	908.7257	536.5832	239.1584	0.0000	0.0000	0.0000	0.0000	540.1966	975.8230	1373.7931	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1438.5226	1138.1760	971.8992	573.8858	255.7843	0.0000	0.0000	0.0000	0.0000	577.7504	1043.6609	1469.2974	(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	222.0100	195.6640	205.4515	184.1199	180.3926	161.1315	154.6965	169.8233	169.5463	190.9244	201.9506	216.6504	(64)
Efficiency of water heater (217)m	88.8129	88.6538	88.3164	87.5026	85.5669	79.8000	79.8000	79.8000	79.8000	87.4384	88.4660	88.8767	(216)
Fuel for water heating, kWh/month	249.9751	220.7055	232.6313	210.4165	210.8205	201.9192	193.8552	212.8111	212.4641	218.3531	228.2803	243.7653	(219)
Water heating fuel used												2635.9973	(219)
Annual totals kWh/year													
Space heating fuel - main system												7468.9766	(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)												523.5279	(232)
Total delivered energy for all uses												10703.5018	(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	7468.9766	0.2160	1613.2989 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2635.9973	0.2160	569.3754 (264)
Space and water heating			2182.6744 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	523.5279	0.5190	271.7110 (268)
Total CO2, kg/m2/year			2493.3104 (272)
Emissions per m2 for space and water heating			13.9254 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.7335 (272b)
Emissions per m2 for pumps and fans			0.2483 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9254 * 1.00) + 1.7335 + 0.2483, rounded to 2 d.p.			15.9100 (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	78.3700 (1b)	x 2.3900 (2b)	= 187.3043 (1b) - (3b)
First floor	78.3700 (1c)	x 2.6700 (2c)	= 209.2479 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.5522 (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) = 0.1009 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3164 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2689 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3429	0.3361	0.3294	0.2958	0.2891	0.2555	0.2555	0.2487	0.2689	0.2891	0.3025	0.3160 (22b)
	0.5588	0.5565	0.5543	0.5438	0.5418	0.5326	0.5326	0.5309	0.5362	0.5418	0.5458	0.5499 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.3700	0.1200	9.4044	84.0000	6583.0800 (28a)
Brick and Block	205.1800	31.6300	173.5500	0.2400	41.6520	42.2200	7327.2810 (29a)
Pitched Roof	78.3700		78.3700	0.1000	7.8370	9.1000	713.1670 (30)
Total net area of external elements Aum(A, m ²)			361.9200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	95.0155	(33)
GF Block			76.3200			75.0000	5724.0000 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			176.4600			9.0000	1588.1400 (32c)
Internal Floor 1			78.3700			18.0000	1410.6600 (32d)
Internal Ceiling 1			78.3700			9.0000	705.3300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24298.5280 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 155.0244 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9191 (36)
Total fabric heat loss (33) + (36) = 100.9346 (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	73.1230	72.8243	72.5315	71.1564	70.8991	69.7014	69.7014	69.4796	70.1627	70.8991	71.4196	71.9637 (38)
Heat transfer coeff	174.0576	173.7589	173.4661	172.0910	171.8337	170.6360	170.6360	170.4142	171.0973	171.8337	172.3542	172.8983 (39)
Average = Sum(39)m / 12 =												172.0898 (39)
HLP	1.1105	1.1086	1.1067	1.0979	1.0963	1.0887	1.0887	1.0872	1.0916	1.0963	1.0996	1.1031 (40)
HLP (average)												1.0979 (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												2.9443 (42)
Average daily hot water use (litres/day)												104.1264 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5390	110.3740	106.2089	102.0439	97.8788	93.7138	93.7138	97.8788	102.0439	106.2089	110.3740	114.5390 (44)
Energy conte	169.8581	148.5590	153.2996	133.6503	128.2406	110.6619	102.5445	117.6713	119.0767	138.7724	151.4809	164.4985 (45)
Energy content (annual)										Total = Sum(45)m =		1638.3138 (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	36.0948	31.5688	32.5762	28.4007	27.2511	23.5157	21.7907	25.0052	25.3038	29.4891	32.1897	34.9559 (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	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.6443	26.3298	21.4129	16.2109	12.1178	10.2304	11.0543	14.3688	19.2858	24.4877	28.5808	30.4682	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.7625	331.1637	322.5929	304.3467	281.3141	259.6668	245.2051	241.8039	250.3747	268.6209	291.6534	313.3008	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	(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)	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	(71)
Water heating gains (Table 5)	48.5146	46.9774	43.7852	39.4454	36.6279	32.6606	29.2886	33.6091	35.1442	39.6359	44.7079	46.9838	(72)
Total internal gains	473.0855	471.6349	454.9549	427.1670	397.2239	369.7219	352.7120	356.9458	371.9687	399.9086	432.1062	457.9168	(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					16.8400	10.6334	0.6300	0.7000	0.7700		54.7250 (74)	
East					2.1700	19.6403	0.6300	0.7000	0.7700		13.0250 (76)	
South					9.5400	46.7521	0.6300	0.7000	0.7700		136.3079 (78)	
West					0.9600	19.6403	0.6300	0.7000	0.7700		5.7622 (80)	
Solar gains	209.8201	364.5713	522.6005	695.1151	827.6192	844.6965	804.6700	701.3017	581.1116	408.8830	252.5072	178.8538 (83)
Total gains	682.9056	836.2062	977.5554	1122.2822	1224.8431	1214.4184	1157.3820	1058.2475	953.0803	808.7916	684.6133	636.7706 (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	38.7779	38.8446	38.9101	39.2211	39.2798	39.5555	39.5555	39.6070	39.4488	39.2798	39.1612	39.0379	
alpha	3.5852	3.5896	3.5940	3.6147	3.6187	3.6370	3.6370	3.6405	3.6299	3.6187	3.6107	3.6025	
util living area	0.9957	0.9908	0.9793	0.9476	0.8739	0.7409	0.5942	0.6551	0.8591	0.9681	0.9922	0.9967	(86)
MIT	19.0732	19.2954	19.6506	20.1155	20.5417	20.8326	20.9451	20.9210	20.6854	20.1279	19.5105	19.0320	(87)
Th 2	19.9923	19.9938	19.9954	20.0025	20.0039	20.0101	20.0101	20.0113	20.0077	20.0039	20.0011	19.9983	(88)
util rest of house	0.9948	0.9887	0.9743	0.9340	0.8389	0.6667	0.4814	0.5447	0.8064	0.9574	0.9901	0.9960	(89)
MIT 2	18.2167	18.4391	18.7927	19.2538	19.6571	19.9113	19.9886	19.9774	19.7971	19.2730	18.6598	18.1800	(90)
Living area fraction									fLA = Living area / (4) =			0.1786	(91)
MIT	18.3697	18.5920	18.9459	19.4077	19.8150	20.0759	20.1594	20.1459	19.9557	19.4257	18.8118	18.3322	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3697	18.5920	18.9459	19.4077	19.8150	20.0759	20.1594	20.1459	19.9557	19.4257	18.8118	18.3322	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	677.8331	823.3896	945.7022	1036.9236	1018.0672	816.3254	578.2322	593.8723	765.4690	767.7339	675.4316	633.0568	(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	2448.9322	2379.1042	2158.9366	1808.2846	1394.4353	934.3798	607.3576	638.3520	1001.8989	1516.5445	2018.5696	2443.4266	(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	1317.6977	1045.4402	902.6464	555.3799	280.0179	0.0000	0.0000	0.0000	0.0000	557.1151	967.0593	1346.9151	(98)
Space heating												6972.2717	(98)
Space heating per m2												(98) / (4) =	44.4830 (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	1603.9785	1262.7065	1295.1480	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7701	0.8414	0.8045	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1235.2200	1062.4335	1041.9665	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1547.6019	1477.9207	1364.6309	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	224.9149	309.1225	240.0624	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												774.0998 (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	56.2287	77.2806	60.0156	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												193.5249 (107)
Space cooling per m2												1.2347 (108)
Energy for space heating												44.4830 (99)
Energy for space cooling												1.2347 (108)
Total												45.7177 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.7 (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	78.3700 (1b)	x 2.3900 (2b)	= 187.3043 (1b) - (3b)
First floor	78.3700 (1c)	x 2.6700 (2c)	= 209.2479 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.5522 (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) = 0.1009 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3509 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2982 (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	0.3803	0.3728	0.3653	0.3281	0.3206	0.2833	0.2833	0.2759	0.2982	0.3206	0.3355	0.3504 (22b)
Effective ac	0.5723	0.5695	0.5667	0.5538	0.5514	0.5401	0.5401	0.5381	0.5445	0.5514	0.5563	0.5614 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			29.5100	1.3258	39.1231		(27)
Ground Floor			78.3700	0.1300	10.1881		(28a)
Brick and Block	205.1800	31.6300	173.5500	0.1800	31.2390		(29a)
Pitched Roof	78.3700		78.3700	0.1300	10.1881		(30)
Total net area of external elements Aum(A, m ²)			361.9200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.8583		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1001 (36)
Total fabric heat loss						(33) + (36) =	107.9584 (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	74.8920	74.5247	74.1646	72.4732	72.1567	70.6835	70.6835	70.4107	71.2510	72.1567	72.7969	73.4662 (38)
Heat transfer coeff	182.8504	182.4831	182.1230	180.4316	180.1151	178.6420	178.6420	178.3691	179.2094	180.1151	180.7553	181.4246 (39)
Average = Sum(39)m / 12 =												180.4300 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1666	1.1642	1.1619	1.1512	1.1491	1.1397	1.1397	1.1380	1.1434	1.1491	1.1532	1.1575 (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												2.9443 (42)
Average daily hot water use (litres/day)												104.1264 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.5390	110.3740	106.2089	102.0439	97.8788	93.7138	93.7138	97.8788	102.0439	106.2089	110.3740	114.5390 (44)
Energy conte	169.8581	148.5590	153.2996	133.6503	128.2406	110.6619	102.5445	117.6713	119.0767	138.7724	151.4809	164.4985 (45)
Energy content (annual)										Total = Sum(45)m =		1638.3138 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	36.0948	31.5688	32.5762	28.4007	27.2511	23.5157	21.7907	25.0052	25.3038	29.4891	32.1897	34.9559 (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	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	147.2135	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.6443	26.3298	21.4129	16.2109	12.1178	10.2304	11.0543	14.3688	19.2858	24.4877	28.5808	30.4682	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.7625	331.1637	322.5929	304.3467	281.3141	259.6668	245.2051	241.8039	250.3747	268.6209	291.6534	313.3008	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	37.7213	(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)	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	(71)
Water heating gains (Table 5)	48.5146	46.9774	43.7852	39.4454	36.6279	32.6606	29.2886	33.6091	35.1442	39.6359	44.7079	46.9838	(72)
Total internal gains	473.0855	471.6349	454.9549	427.1670	397.2239	369.7219	352.7120	356.9458	371.9687	399.9086	432.1062	457.9168	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	16.8400	10.6334	0.6300	0.7000	0.7700	54.7250	(74)
East	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250	(76)
South	9.5400	46.7521	0.6300	0.7000	0.7700	136.3079	(78)
West	0.9600	19.6403	0.6300	0.7000	0.7700	5.7622	(80)

Solar gains	209.8201	364.5713	522.6005	695.1151	827.6192	844.6965	804.6700	701.3017	581.1116	408.8830	252.5072	178.8538	(83)
Total gains	682.9056	836.2062	977.5554	1122.2822	1224.8431	1214.4184	1157.3820	1058.2475	953.0803	808.7916	684.6133	636.7706	(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	59.5280	59.6478	59.7658	60.3260	60.4320	60.9304	60.9304	61.0236	60.7375	60.4320	60.2180	59.9959		
alpha	4.9685	4.9765	4.9844	5.0217	5.0288	5.0620	5.0620	5.0682	5.0492	5.0288	5.0145	4.9997		
util living area	0.9995	0.9986	0.9955	0.9825	0.9344	0.8089	0.6451	0.7143	0.9224	0.9916	0.9989	0.9997	(86)	
MIT	19.5836	19.7432	20.0030	20.3527	20.6820	20.9033	20.9764	20.9612	20.7856	20.3581	19.9050	19.5571	(87)	
Th 2	19.9468	19.9487	19.9506	19.9593	19.9609	19.9685	19.9685	19.9699	19.9656	19.9609	19.9576	19.9542	(88)	
util rest of house	0.9994	0.9981	0.9938	0.9749	0.9038	0.7237	0.5106	0.5826	0.8727	0.9869	0.9985	0.9996	(89)	
MIT 2	18.6454	18.8063	19.0668	19.4193	19.7326	19.9204	19.9621	19.9578	19.8340	19.4288	18.9752	18.6248	(90)	
Living area fraction									fLA = Living area / (4) =			0.1786	(91)	
MIT	18.8129	18.9736	19.2340	19.5860	19.9022	20.0959	20.1432	20.1370	20.0039	19.5948	19.1412	18.7913	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.8129	18.9736	19.2340	19.5860	19.9022	20.0959	20.1432	20.1370	20.0039	19.5948	19.1412	18.7913	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	682.3080	834.0848	969.8848	1090.0721	1104.3518	893.3204	619.0908	641.3323	833.9868	796.2916	683.1912	636.3809	(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	2653.6992	2568.2019	2319.1502	1928.0913	1477.3316	981.7977	632.9639	666.5587	1058.0344	1620.0961	2176.5184	2647.2144	(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	1466.7150	1165.3267	1003.8534	603.3739	277.4969	0.0000	0.0000	0.0000	0.0000	612.9105	1075.1956	1496.0601	(98)	
Space heating												7700.9322	(98)	
Space heating per m2												(98) / (4) =	49.1319	(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	1679.2343	1321.9504	1355.6055	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7992	0.8779	0.8380	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1342.0080	1160.5182	1135.9515	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1547.6019	1477.9207	1364.6309	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	148.0276	236.1475	170.1375	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												554.3126 (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	0.0000	37.0069	59.0369	42.5344	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												138.5782 (107)
Space cooling per m2												0.8841 (108)
Energy for space heating												49.1319 (99)
Energy for space cooling												0.8841 (108)
Total												50.0160 (109)
Target Fabric Energy Efficiency (TFEE)												57.5 (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	78.3700 (1b)	x 2.3900 (2b)	= 187.3043 (1b) - (3b)
First floor	78.3700 (1c)	x 2.6700 (2c)	= 209.2479 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.5522 (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					5 * 10 = 50.0000 (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)					50.0000 / (5) = 0.1261 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3416 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2903 (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	0.3412	0.3194	0.3194	0.2903	0.2976	0.2831	0.2831	0.2758	0.2758	0.2976	0.2903	0.2976 (22b)
Effective ac	0.5582	0.5510	0.5510	0.5422	0.5443	0.5401	0.5401	0.5380	0.5380	0.5443	0.5422	0.5443 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.3700	0.1200	9.4044	84.0000	6583.0800 (28a)
Brick and Block	205.1800	31.6300	173.5500	0.2400	41.6520	42.2200	7327.2810 (29a)
Pitched Roof	78.3700		78.3700	0.1000	7.8370	9.1000	713.1670 (30)
Total net area of external elements Aum(A, m ²)			361.9200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0155		(33)
GF Block			76.3200			75.0000	5724.0000 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			176.4600			9.0000	1588.1400 (32c)
Internal Floor 1			78.3700			18.0000	1410.6600 (32d)
Internal Ceiling 1			78.3700			18.0000	1410.6600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25003.8580 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.5244 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9191 (36)
Total fabric heat loss (33) + (36) = 100.9346 (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	73.0466	72.1055	72.1055	70.9471	71.2264	70.6748	70.6748	70.4093	70.4093	71.2264	70.9471	71.2264 (38)
Heat transfer coeff	173.9812	173.0401	173.0401	171.8817	172.1610	171.6094	171.6094	171.3439	171.3439	172.1610	171.8817	172.1610 (39)
Average = Sum(39)m / 12 =												172.1845 (39)
HLP	1.1100	1.1040	1.1040	1.0966	1.0984	1.0949	1.0949	1.0932	1.0932	1.0984	1.0966	1.0984 (40)
HLP (average)												1.0985 (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												2.9443 (42)
Average daily hot water use (litres/day)												104.1264 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5390	110.3740	106.2089	102.0439	97.8788	93.7138	93.7138	97.8788	102.0439	106.2089	110.3740	114.5390 (44)
Energy conte	169.8581	148.5590	153.2996	133.6503	128.2406	110.6619	102.5445	117.6713	119.0767	138.7724	151.4809	164.4985 (45)
Energy content (annual)										Total = Sum(45)m =		1638.3138 (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	25.4787	22.2838	22.9949	20.0475	19.2361	16.5993	15.3817	17.6507	17.8615	20.8159	22.7221	24.6748 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
222.0807 195.7278 205.5222 184.1883 180.4632 161.1999 154.7671 169.8939 169.6147 190.9950 202.0189 216.7211 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	222.0807	195.7278	205.5222	184.1883	180.4632	161.1999	154.7671	169.8939	169.6147	190.9950	202.0189	216.7211 (64)
RHI water heating demand												2253.1928 (64)
Heat gains from water heating, kWh/month	98.2559	87.1309	92.7502	84.8691	84.4181	77.2255	75.8741	80.9038	80.0234	87.9199	90.7978	96.4738 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.1108	65.8246	53.5321	40.5273	30.2946	25.5760	27.6357	35.9220	48.2144	61.2193	71.4519	76.1706 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	489.1978	494.2741	481.4819	454.2488	419.8719	387.5624	365.9777	360.9014	373.6936	400.9267	435.3036	467.6131 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099 (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)	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708 (71)
Water heating gains (Table 5)	132.0644	129.6591	124.6642	117.8738	113.4652	107.2576	101.9814	108.7417	111.1436	118.1719	126.1081	129.6691 (72)
Total internal gains	812.8682	807.2530	777.1735	730.1451	681.1269	637.8913	613.0901	623.0603	650.5469	697.8132	750.3589	790.9480 (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					16.8400	13.4684	0.6300	0.7000	0.7700		69.3155 (74)	
East					2.1700	25.1733	0.6300	0.7000	0.7700		16.6944 (76)	
South					9.5400	56.5862	0.6300	0.7000	0.7700		164.9798 (78)	
West					0.9600	25.1733	0.6300	0.7000	0.7700		7.3855 (80)	

Solar gains	258.3753	383.3287	563.3614	758.9623	854.9770	967.1587	884.6351	801.3833	658.1368	464.9751	310.1617	208.3596 (83)
Total gains	1071.2435	1190.5817	1340.5349	1489.1074	1536.1039	1605.0500	1497.7252	1424.4436	1308.6836	1162.7883	1060.5206	999.3076 (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	39.9211	40.1382	40.1382	40.4087	40.3432	40.4728	40.4728	40.5355	40.5355	40.3432	40.4087	40.3432
alpha	3.6614	3.6759	3.6759	3.6939	3.6895	3.6982	3.6982	3.7024	3.7024	3.6895	3.6939	3.6895
util living area	0.9788	0.9683	0.9390	0.8668	0.7365	0.5173	0.3716	0.3779	0.6524	0.8800	0.9604	0.9824 (86)
MIT	19.6171	19.7747	20.0998	20.5042	20.8055	20.9618	20.9917	20.9915	20.9100	20.5671	20.0531	19.5947 (87)
Th 2	19.9927	19.9776	19.9976	20.0036	20.0022	20.0050	20.0050	20.0064	20.0064	20.0022	20.0036	20.0022 (88)
util rest of house	0.9740	0.9612	0.9251	0.8362	0.6765	0.4269	0.2627	0.2640	0.5625	0.8438	0.9497	0.9784 (89)
MIT 2	18.1785	18.4082	18.8716	19.4339	19.8165	19.9811	20.0024	20.0039	19.9402	19.5296	18.8161	18.1528 (90)
Living area fraction									fLA = Living area / (4) =			0.1786 (91)
MIT	18.4354	18.6523	19.0910	19.6251	19.9931	20.1562	20.1791	20.1802	20.1134	19.7149	19.0370	18.4103 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4354	18.6523	19.0910	19.6251	19.9931	20.1562	20.1791	20.1802	20.1134	19.7149	19.0370	18.4103 (93)

8. Space heating requirement

Utilisation	0.9635	0.9484	0.9091	0.8226	0.6759	0.4412	0.2821	0.2843	0.5730	0.8312	0.9359	0.9691 (94)
Useful gains	1032.1196	1129.1553	1218.7261	1224.9067	1038.3006	708.2097	422.5214	404.9920	749.8633	966.5382	992.5562	968.4037 (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	2233.1232	2189.3481	1988.3950	1637.1848	1186.7192	730.4066	425.4283	407.8381	807.6047	1310.9878	1793.9246	2188.2166 (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	893.5467	712.4495	572.6336	296.8402	110.4234	0.0000	0.0000	0.0000	0.0000	256.2705	576.9853	907.5408 (98)
Space heating												4326.6901 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

RHI space heating demand

4327 (98)

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	78.3700 (1b)	x 2.3900 (2b)	= 187.3043 (1b) - (3b)
First floor	78.3700 (1c)	x 2.6700 (2c)	= 209.2479 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.5522 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1261 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3416 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2903 (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	0.3702	0.3629	0.3557	0.3194	0.3121	0.2758	0.2758	0.2686	0.2903	0.3121	0.3266	0.3412 (22b)
Effective ac	0.5685	0.5659	0.5633	0.5510	0.5487	0.5380	0.5380	0.5361	0.5422	0.5487	0.5533	0.5582 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.3700	0.1200	9.4044	84.0000	6583.0800 (28a)
Brick and Block	205.1800	31.6300	173.5500	0.2400	41.6520	42.2200	7327.2810 (29a)
Pitched Roof	78.3700		78.3700	0.1000	7.8370	9.1000	713.1670 (30)
Total net area of external elements Aum(A, m ²)			361.9200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	95.0155	(33)
GF Block			76.3200			75.0000	5724.0000 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			176.4600			9.0000	1588.1400 (32c)
Internal Floor 1			78.3700			18.0000	1410.6600 (32d)
Internal Ceiling 1			78.3700			18.0000	1410.6600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25003.8580 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.5244 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9191 (36)
Total fabric heat loss (33) + (36) = 100.9346 (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	74.3981	74.0499	73.7086	72.1055	71.8055	70.4093	70.4093	70.1507	70.9471	71.8055	72.4123	73.0466 (38)
Heat transfer coeff	175.3327	174.9845	174.6432	173.0401	172.7401	171.3439	171.3439	171.0853	171.8817	172.7401	173.3469	173.9812 (39)
Average = Sum(39)m / 12 =												173.0386 (39)
HLP	1.1186	1.1164	1.1142	1.1040	1.1021	1.0932	1.0932	1.0915	1.0966	1.1021	1.1060	1.1100 (40)
HLP (average)												1.1040 (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												2.9443 (42)
Average daily hot water use (litres/day)												104.1264 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5390	110.3740	106.2089	102.0439	97.8788	93.7138	93.7138	97.8788	102.0439	106.2089	110.3740	114.5390 (44)
Energy conte	169.8581	148.5590	153.2996	133.6503	128.2406	110.6619	102.5445	117.6713	119.0767	138.7724	151.4809	164.4985 (45)
Energy content (annual)										Total = Sum(45)m =		1638.3138 (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	25.4787	22.2838	22.9949	20.0475	19.2361	16.5993	15.3817	17.6507	17.8615	20.8159	22.7221	24.6748 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
222.0807 195.7278 205.5222 184.1883 180.4632 161.1999 154.7671 169.8939 169.6147 190.9950 202.0189 216.7211 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	222.0807	195.7278	205.5222	184.1883	180.4632	161.1999	154.7671	169.8939	169.6147	190.9950	202.0189	216.7211 (64)
Total per year (kWh/year) = Sum(64)m =												2253.1928 (64)
Heat gains from water heating, kWh/month												
98.2559 87.1309 92.7502 84.8691 84.4181 77.2255 75.8741 80.9038 80.0234 87.9199 90.7978 96.4738 (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	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	74.1108	65.8246	53.5321	40.5273	30.2946	25.5760	27.6357	35.9220	48.2144	61.2193	71.4519	76.1706	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	489.1978	494.2741	481.4819	454.2488	419.8719	387.5624	365.9777	360.9014	373.6936	400.9267	435.3036	467.6131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	(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)													
	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	(71)
Water heating gains (Table 5)													
	132.0644	129.6591	124.6642	117.8738	113.4652	107.2576	101.9814	108.7417	111.1436	118.1719	126.1081	129.6691	(72)
Total internal gains													
	812.8682	807.2530	777.1735	730.1451	681.1269	637.8913	613.0901	623.0603	650.5469	697.8132	750.3589	790.9480	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	16.8400	10.6334	0.6300	0.7000	0.7700	54.7250 (74)
East	2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (76)
South	9.5400	46.7521	0.6300	0.7000	0.7700	136.3079 (78)
West	0.9600	19.6403	0.6300	0.7000	0.7700	5.7622 (80)

Solar gains	209.8201	364.5713	522.6005	695.1151	827.6192	844.6965	804.6700	701.3017	581.1116	408.8830	252.5072	178.8538 (83)
Total gains	1022.6884	1171.8244	1299.7740	1425.2602	1508.7462	1482.5878	1417.7601	1324.3619	1231.6585	1106.6962	1002.8661	969.8018 (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	39.6134	39.6922	39.7698	40.1382	40.2079	40.5355	40.5355	40.5968	40.4087	40.2079	40.0671	39.9211	
alpha	3.6409	3.6461	3.6513	3.6759	3.6805	3.7024	3.7024	3.7065	3.6939	3.6805	3.6711	3.6614	
util living area	0.9858	0.9757	0.9554	0.9069	0.8103	0.6565	0.5064	0.5559	0.7718	0.9280	0.9762	0.9882 (86)	
MIT	19.3756	19.5830	19.9068	20.3196	20.6738	20.8950	20.9694	20.9567	20.7998	20.3462	19.7857	19.3341 (87)	
Th 2	19.9857	19.9875	19.9892	19.9976	19.9991	20.0064	20.0064	20.0078	20.0036	19.9991	19.9960	19.9927 (88)	
util rest of house	0.9827	0.9706	0.9455	0.8854	0.7658	0.5787	0.4025	0.4510	0.7051	0.9068	0.9702	0.9856 (89)	
MIT 2	17.8230	18.1242	18.5912	19.1786	19.6530	19.9211	19.9901	19.9828	19.8213	19.2275	18.4264	17.7673 (90)	
Living area fraction										fLA = Living area / (4) =		0.1786 (91)	
MIT	18.1002	18.3847	18.8261	19.3824	19.8352	20.0950	20.1650	20.1567	19.9960	19.4273	18.6691	18.0471 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.1002	18.3847	18.8261	19.3824	19.8352	20.0950	20.1650	20.1567	19.9960	19.4273	18.6691	18.0471 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9744	0.9592	0.9306	0.8694	0.7576	0.5861	0.4198	0.4676	0.7045	0.8915	0.9591	0.9783 (94)
Useful gains	996.5358	1124.0105	1209.5280	1239.1083	1142.9912	868.9781	595.1521	619.2502	867.7245	986.6195	961.8798	948.7947 (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												
	2419.6296	2359.6086	2152.6712	1813.8689	1405.2835	941.5303	610.8436	642.7195	1013.4180	1524.8243	2005.4747	2409.1401 (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												
	1058.7818	830.3219	701.6985	413.8277	195.1455	0.0000	0.0000	0.0000	0.0000	400.4244	751.3883	1086.4970 (98)
Space heating												5438.0851 (98)
Space heating per m2												(98) / (4) = 34.6949 (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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6008.9338 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1058.7818	830.3219	701.6985	413.8277	195.1455	0.0000	0.0000	0.0000	0.0000	400.4244	751.3883	1086.4970	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1169.9246	917.4828	775.3575	457.2681	215.6304	0.0000	0.0000	0.0000	0.0000	442.4579	830.2633	1200.5492	(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	222.0807	195.7278	205.5222	184.1883	180.4632	161.1999	154.7671	169.8939	169.6147	190.9950	202.0189	216.7211	(64)
Efficiency of water heater (217)m	88.4438	88.2429	87.8320	86.9108	85.0227	79.8000	79.8000	79.8000	79.8000	86.7438	87.9998	88.5261	(216)
Fuel for water heating, kWh/month	251.0980	221.8056	233.9945	211.9281	212.2530	202.0049	193.9438	212.8997	212.5497	220.1828	229.5675	244.8105	(219)
Water heating fuel used												2647.0381	(219)
Annual totals kWh/year													
Space heating fuel - main system												6008.9338	(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)												523.5279	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 1068 * 1.00) =										-828.8227		-828.8227	(233)
Total delivered energy for all uses												8425.6772	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6008.9338	3.4800	209.1109 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2647.0381	3.4800	92.1169 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	523.5279	13.1900	69.0533 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-828.8227	13.1900	-109.3217 (252)
Total energy cost			390.8519 (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] =	0.8137 (257)
SAP value		88.6487
SAP rating (Section 12)		89 (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	6008.9338	0.2160	1297.9297 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2647.0381	0.2160	571.7602 (264)
Space and water heating			1869.6899 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	523.5279	0.5190	271.7110 (268)
Energy saving/generation technologies			
PV Unit	-828.8227	0.5190	-430.1590 (269)
Total kg/year			1750.1670 (272)
CO2 emissions per m2			11.1700 (273)
EI value			88.3750
EI rating			88 (274)
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8491 = 4.098$, stars = 4
Water heating environmental impact	$0.216 / 0.8491 = 0.2544$, 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	78.3700 (1b)	x 2.3900 (2b)	= 187.3043 (1b) - (3b)
First floor	78.3700 (1c)	x 2.6700 (2c)	= 209.2479 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.5522 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1261 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3416 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2903 (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	0.3412	0.3194	0.3194	0.2903	0.2976	0.2831	0.2831	0.2758	0.2758	0.2976	0.2903	0.2976 (22b)
Effective ac	0.5582	0.5510	0.5510	0.5422	0.5443	0.5401	0.5401	0.5380	0.5380	0.5443	0.5422	0.5443 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.3700	0.1200	9.4044	84.0000	6583.0800 (28a)
Brick and Block	205.1800	31.6300	173.5500	0.2400	41.6520	42.2200	7327.2810 (29a)
Pitched Roof	78.3700		78.3700	0.1000	7.8370	9.1000	713.1670 (30)
Total net area of external elements Aum(A, m ²)			361.9200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0155		(33)
GF Block			76.3200			75.0000	5724.0000 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			176.4600			9.0000	1588.1400 (32c)
Internal Floor 1			78.3700			18.0000	1410.6600 (32d)
Internal Ceiling 1			78.3700			18.0000	1410.6600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25003.8580 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.5244 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9191 (36)
Total fabric heat loss (33) + (36) = 100.9346 (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	73.0466	72.1055	72.1055	70.9471	71.2264	70.6748	70.6748	70.4093	70.4093	71.2264	70.9471	71.2264 (38)
Heat transfer coeff	173.9812	173.0401	173.0401	171.8817	172.1610	171.6094	171.6094	171.3439	171.3439	172.1610	171.8817	172.1610 (39)
Average = Sum(39)m / 12 =												172.1845 (39)
HLP	1.1100	1.1040	1.1040	1.0966	1.0984	1.0949	1.0949	1.0932	1.0932	1.0984	1.0966	1.0984 (40)
HLP (average)												1.0985 (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												2.9443 (42)
Average daily hot water use (litres/day)												104.1264 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.5390	110.3740	106.2089	102.0439	97.8788	93.7138	93.7138	97.8788	102.0439	106.2089	110.3740	114.5390 (44)
Energy conte	169.8581	148.5590	153.2996	133.6503	128.2406	110.6619	102.5445	117.6713	119.0767	138.7724	151.4809	164.4985 (45)
Energy content (annual)										Total = Sum(45)m =		1638.3138 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	25.4787	22.2838	22.9949	20.0475	19.2361	16.5993	15.3817	17.6507	17.8615	20.8159	22.7221	24.6748 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
222.0807 195.7278 205.5222 184.1883 180.4632 161.1999 154.7671 169.8939 169.6147 190.9950 202.0189 216.7211 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	222.0807	195.7278	205.5222	184.1883	180.4632	161.1999	154.7671	169.8939	169.6147	190.9950	202.0189	216.7211 (64)
Total per year (kWh/year) = Sum(64)m =												2253.1928 (64)
Heat gains from water heating, kWh/month												
98.2559 87.1309 92.7502 84.8691 84.4181 77.2255 75.8741 80.9038 80.0234 87.9199 90.7978 96.4738 (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	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	74.1108	65.8246	53.5321	40.5273	30.2946	25.5760	27.6357	35.9220	48.2144	61.2193	71.4519	76.1706	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	489.1978	494.2741	481.4819	454.2488	419.8719	387.5624	365.9777	360.9014	373.6936	400.9267	435.3036	467.6131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	55.6099	(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)													
	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	-117.7708	(71)
Water heating gains (Table 5)													
	132.0644	129.6591	124.6642	117.8738	113.4652	107.2576	101.9814	108.7417	111.1436	118.1719	126.1081	129.6691	(72)
Total internal gains													
	812.8682	807.2530	777.1735	730.1451	681.1269	637.8913	613.0901	623.0603	650.5469	697.8132	750.3589	790.9480	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	16.8400	13.4684	0.6300	0.7000	0.7700	69.3155 (74)
East	2.1700	25.1733	0.6300	0.7000	0.7700	16.6944 (76)
South	9.5400	56.5862	0.6300	0.7000	0.7700	164.9798 (78)
West	0.9600	25.1733	0.6300	0.7000	0.7700	7.3855 (80)

Solar gains	258.3753	383.3287	563.3614	758.9623	854.9770	967.1587	884.6351	801.3833	658.1368	464.9751	310.1617	208.3596 (83)
Total gains	1071.2435	1190.5817	1340.5349	1489.1074	1536.1039	1605.0500	1497.7252	1424.4436	1308.6836	1162.7883	1060.5206	999.3076 (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	39.9211	40.1382	40.1382	40.4087	40.3432	40.4728	40.4728	40.5355	40.5355	40.3432	40.4087	40.3432
alpha	3.6614	3.6759	3.6759	3.6939	3.6895	3.6982	3.6982	3.7024	3.7024	3.6895	3.6939	3.6895
util living area	0.9788	0.9683	0.9390	0.8668	0.7365	0.5173	0.3716	0.3779	0.6524	0.8800	0.9604	0.9824 (86)
MIT	19.6171	19.7747	20.0998	20.5042	20.8055	20.9618	20.9917	20.9915	20.9100	20.5671	20.0531	19.5947 (87)
Th 2	19.9927	19.9976	19.9976	20.0036	20.0022	20.0050	20.0050	20.0064	20.0064	20.0022	20.0036	20.0022 (88)
util rest of house												
	0.9740	0.9612	0.9251	0.8362	0.6765	0.4269	0.2627	0.2640	0.5625	0.8438	0.9497	0.9784 (89)
MIT 2	18.1785	18.4082	18.8716	19.4339	19.8165	19.9811	20.0024	20.0039	19.9402	19.5296	18.8161	18.1528 (90)
Living area fraction												
MIT	18.4354	18.6523	19.0910	19.6251	19.9931	20.1562	20.1791	20.1802	20.1134	19.7149	19.0370	18.4103 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4354	18.6523	19.0910	19.6251	19.9931	20.1562	20.1791	20.1802	20.1134	19.7149	19.0370	18.4103 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9635	0.9484	0.9091	0.8226	0.6759	0.4412	0.2821	0.2843	0.5730	0.8312	0.9359	0.9691 (94)
Useful gains	1032.1196	1129.1553	1218.7261	1224.9067	1038.3006	708.2097	422.5214	404.9920	749.8633	966.5382	992.5562	968.4037 (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												
	2233.1232	2189.3481	1988.3950	1637.1848	1186.7192	730.4066	425.4283	407.8381	807.6047	1310.9878	1793.9246	2188.2166 (97)
Month fracti	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												
	893.5467	712.4495	572.6336	296.8402	110.4234	0.0000	0.0000	0.0000	0.0000	256.2705	576.9853	907.5408 (98)
Space heating												
Space heating per m2												
										(98) / (4) =		
												4326.6901 (98)
												27.6042 (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 %)												90.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4780.8730	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	893.5467	712.4495	572.6336	296.8402	110.4234	0.0000	0.0000	0.0000	0.0000	256.2705	576.9853	907.5408	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	987.3444	787.2370	632.7444	328.0002	122.0149	0.0000	0.0000	0.0000	0.0000	283.1718	637.5528	1002.8075	(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	222.0807	195.7278	205.5222	184.1883	180.4632	161.1999	154.7671	169.8939	169.6147	190.9950	202.0189	216.7211	(64)
Efficiency of water heater (217)m	88.1472	87.9582	87.4047	86.0805	83.5499	79.8000	79.8000	79.8000	79.8000	85.5988	87.4589	88.2198	(216)
Fuel for water heating, kWh/month	251.9429	222.5236	235.1387	213.9722	215.9946	202.0049	193.9438	212.8997	212.5497	223.1282	230.9874	245.6605	(219)
Water heating fuel used												2660.7461	(219)
Annual totals kWh/year													
Space heating fuel - main system												4780.8730	(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)												523.5279	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 1184 * 1.00) =										-918.7195		-918.7195	(233)
Total delivered energy for all uses												7121.4275	(238)

10a. Fuel costs - using BEDF prices (500)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4780.8730	3.6300	173.5457 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2660.7461	3.6300	96.5851 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	523.5279	19.4400	101.7738 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-918.7195	19.4400	-178.5991 (252)
Total energy cost			302.8855 (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	4780.8730	0.2160	1032.6686 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2660.7461	0.2160	574.7212 (264)
Space and water heating			1607.3897 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	523.5279	0.5190	271.7110 (268)
Energy saving/generation technologies			
PV Unit	-918.7195	0.5190	-476.8154 (269)
Total kg/year			1441.2103 (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	4780.8730	1.2200	5832.6651 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2660.7461	1.2200	3246.1102 (264)
Space and water heating			9078.7753 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	523.5279	3.0700	1607.2308 (268)
Energy saving/generation technologies			

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PV Unit	-918.7195	3.0700	-2820.4690 (269)
Primary energy kWh/year			8095.7871 (272)
Primary energy kWh/m2/year			51.6511 (273)

SAP 2012 EPC IMPROVEMENTS

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

(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	+ 1.1	-£ 40	-272 kg (18.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£40 1.74 kg/m²	B 90	B 90
Total Savings	£40 1.74 kg/m²		
Potential energy efficiency rating:		B 90	
Potential environmental impact rating:			B 90

Fuel prices for cost data on this page from database revision number 500 TEST (30 Jun 2022)
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	£116	£126	-£10
Mains gas	£365	£315	£50
Space heating	£283	£285	-£2
Water heating	£97	£55	£42
Lighting	£102	£102	£0
Generated (PV)	-£179	-£179	£0
Total cost of fuels	£302	£262	£40
Total cost of uses	£303	£263	£40
Delivered energy	45 kWh/m²	37 kWh/m²	8 kWh/m²
Carbon dioxide emissions	1.4 tonnes	1.2 tonnes	0.3 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	52 kWh/m²	42 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	78.3700 (1b)	x 2.3900 (2b)	= 187.3043 (1b) - (3b)
First floor	78.3700 (1c)	x 2.6700 (2c)	= 209.2479 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.5522 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1261 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3416 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2903 (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	0.3702	0.3629	0.3557	0.3194	0.3121	0.2758	0.2758	0.2686	0.2903	0.3121	0.3266	0.3412 (22b)
Effective ac	0.5685	0.5659	0.5633	0.5510	0.5487	0.5380	0.5380	0.5361	0.5422	0.5487	0.5533	0.5582 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.3700	0.1200	9.4044	84.0000	6583.0800 (28a)
Brick and Block	205.1800	31.6300	173.5500	0.2400	41.6520	42.2200	7327.2810 (29a)
Pitched Roof	78.3700		78.3700	0.1000	7.8370	9.1000	713.1670 (30)
Total net area of external elements Aum(A, m ²)			361.9200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	95.0155	(33)
GF Block			76.3200			75.0000	5724.0000 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			176.4600			9.0000	1588.1400 (32c)
Internal Floor 1			78.3700			18.0000	1410.6600 (32d)
Internal Ceiling 1			78.3700			18.0000	1410.6600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25003.8580 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.5244 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9191 (36)
Total fabric heat loss (33) + (36) = 100.9346 (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	74.3981	74.0499	73.7086	72.1055	71.8055	70.4093	70.4093	70.1507	70.9471	71.8055	72.4123	73.0466 (38)
Heat transfer coeff	175.3327	174.9845	174.6432	173.0401	172.7401	171.3439	171.3439	171.0853	171.8817	172.7401	173.3469	173.9812 (39)
Average = Sum(39)m / 12 =												173.0386 (39)
HLP	1.1186	1.1164	1.1142	1.1040	1.1021	1.0932	1.0932	1.0915	1.0966	1.1021	1.1060	1.1100 (40)
HLP (average)												1.1040 (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												2.9443 (42)
Average daily hot water use (litres/day)												104.1264 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5390	110.3740	106.2089	102.0439	97.8788	93.7138	93.7138	97.8788	102.0439	106.2089	110.3740	114.5390 (44)
Energy conte	169.8581	148.5590	153.2996	133.6503	128.2406	110.6619	102.5445	117.6713	119.0767	138.7724	151.4809	164.4985 (45)
Energy content (annual)										Total = Sum(45)m =		1638.3138 (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	25.4787	22.2838	22.9949	20.0475	19.2361	16.5993	15.3817	17.6507	17.8615	20.8159	22.7221	24.6748 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
18.8578 17.0329 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 (57)												
Primary loss												
23.2624 21.0112 21.8667 15.7584 10.4681 9.9053 10.2355 11.1660 17.1091 21.8667 22.5120 23.2624 (59)												
Total heat required for water heating calculated for each month												
211.9783 186.6030 194.0240 167.6582 157.5665 138.8167 131.6378 147.6951 154.4353 179.4969 192.2424 206.6187 (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												1.1070 (H8)
Utilisation factor												0.5948 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												104.1264 (H14)
Volume ratio Veff/V												1.1236 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-948.5034 (H17)
Solar input	-27.5047	-45.8974	-78.1686	-104.7613	-129.4238	-127.2442	-125.5626	-109.7047	-85.9208	-58.6738	-32.6245	-23.0167 (63)
Solar input (sum of months) = Sum (63)m =												-948.5034 (63)
Output from w/h												
184.4736 140.7056 115.8554 62.8968 28.1427 11.5724 6.0751 37.9904 68.5145 120.8231 159.6179 183.6020 (64)												
Total per year (kWh/year) = Sum (64)m =												1120.2694 (64)
Heat gains from water heating, kWh/month												
90.1740 79.8311 83.5517 71.6450 66.1007 59.3189 57.3707 63.1447 67.8799 78.7214 82.9766 88.3919 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
74.1108 65.8246 53.5321 40.5273 30.2946 25.5760 27.6357 35.9220 48.2144 61.2193 71.4519 76.1706 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
489.1978 494.2741 481.4819 454.2488 419.8719 387.5624 365.9777 360.9014 373.6936 400.9267 435.3036 467.6131 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 (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)												
-117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 (71)												
Water heating gains (Table 5)												
121.2016 118.7963 112.3006 99.5070 88.8450 82.3874 77.1111 84.8719 94.2776 105.8083 115.2453 118.8063 (72)												
Total internal gains												
802.0054 796.3902 764.8099 711.7783 656.5068 613.0210 588.2198 599.1906 633.6809 685.4496 739.4961 780.0853 (73)												

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
North		16.8400	10.6334	0.6300	0.7000	0.7700	54.7250 (74)
East		2.1700	19.6403	0.6300	0.7000	0.7700	13.0250 (76)
South		9.5400	19.6403	0.6300	0.7000	0.7700	136.3079 (78)
West		0.9600	19.6403	0.6300	0.7000	0.7700	5.7622 (80)

Solar gains	209.8201	364.5713	522.6005	695.1151	827.6192	844.6965	804.6700	701.3017	581.1116	408.8830	252.5072	178.8538 (83)
Total gains	1011.8256	1160.9616	1287.4105	1406.8934	1484.1260	1457.7175	1392.8898	1300.4922	1214.7925	1094.3326	992.0033	958.9390 (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)												
tau	39.6134	39.6922	39.7698	40.1382	40.2079	40.5355	40.5355	40.5968	40.4087	40.2079	40.0671	39.9211
alpha	3.6409	3.6461	3.6513	3.6759	3.6805	3.7024	3.7024	3.7065	3.6939	3.6805	3.6711	3.6614
util living area												
0.9862 0.9764 0.9566 0.9099 0.8163 0.6642 0.5142 0.5642 0.7774 0.9301 0.9770 0.9886 (86)												
MIT	19.3669	19.5747	19.8981	20.3090	20.6644	20.8907	20.9679	20.9546	20.7944	20.3384	19.7774	19.3254 (87)
Th 2	19.9857	19.9875	19.9892	19.9976	19.9991	20.0064	20.0064	20.0078	20.0036	19.9991	19.9960	19.9927 (88)
util rest of house												
0.9833 0.9714 0.9469 0.8888 0.7725 0.5864 0.4091 0.4584 0.7112 0.9094 0.9712 0.9861 (89)												
MIT 2	17.8104	18.1122	18.5789	19.1644	19.6419	19.9172	19.9892	19.9814	19.8158	19.2170	18.4145	17.7546 (90)
Living area fraction												
MIT	18.0884	18.3734	18.8145	19.3688	19.8245	20.0911	20.1640	20.1552	19.9905	19.4173	18.6578	18.0351 (92)
Temperature adjustment												0.0000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

adjusted MIT 18.0884 18.3734 18.8145 19.3688 19.8245 20.0911 20.1640 20.1552 19.9905 19.4173 18.6578 18.0351 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9752	0.9602	0.9321	0.8728	0.7638	0.5936	0.4265	0.4750	0.7102	0.8941	0.9603	0.9790	(94)
Useful gains	986.7020	1114.7221	1200.0216	1227.9205	1133.6327	865.2617	594.1316	617.7511	862.7916	978.4248	952.5972	938.8177	(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	2417.5551	2357.6357	2150.6420	1811.5210	1403.4230	940.8590	610.6681	642.4598	1012.4728	1523.0988	2003.5172	2407.0532	(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	1064.5547	835.2379	707.2616	420.1924	200.7240	0.0000	0.0000	0.0000	0.0000	405.2375	756.6624	1092.3673	(98)
Space heating													
Space heating per m2													(98) / (4) = 34.9766 (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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6057.7213 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1064.5547	835.2379	707.2616	420.1924	200.7240	0.0000	0.0000	0.0000	0.0000	405.2375	756.6624	1092.3673	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1176.3036	922.9149	781.5045	464.3010	221.7945	0.0000	0.0000	0.0000	0.0000	447.7762	836.0910	1207.0356	(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	184.4736	140.7056	115.8554	62.8968	28.1427	11.5724	6.0751	37.9904	68.5145	120.8231	159.6179	183.6020	(64)
Efficiency of water heater (217)m	88.7426	88.7837	88.8237	88.9472	89.0321	79.8000	79.8000	79.8000	79.8000	87.7962	88.4344	88.7870	(216)
Fuel for water heating, kWh/month	207.8749	158.4814	130.4331	70.7125	31.6096	14.5018	7.6129	47.6070	85.8578	137.6176	180.4931	206.7893	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													6057.7213 (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)													523.5279 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 1068 * 1.00) =										-828.8227		-828.8227	(233)
Total delivered energy for all uses													7157.0175 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6057.7213	3.4800	210.8087 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1279.5910	3.4800	44.5298 (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	523.5279	13.1900	69.0533 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-828.8227	13.1900	-109.3217 (252)
Total energy cost			351.5576 (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] =	0.7319 (257)
SAP value		89.7899
SAP rating (Section 12)		90 (258)
SAP band		B

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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	6057.7213	0.2160	1308.4678	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1279.5910	0.2160	276.3917	(264)
Space and water heating			1584.8595	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	523.5279	0.5190	271.7110	(268)
Energy saving/generation technologies				
PV Unit	-828.8227	0.5190	-430.1590	(269)
Total kg/year			1491.2865	(272)
CO2 emissions per m2			9.5100	(273)
EI value			90.0946	
EI rating			90	(274)
EI band			B	

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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	78.3700 (1b)	x 2.3900 (2b)	= 187.3043 (1b) - (3b)
First floor	78.3700 (1c)	x 2.6700 (2c)	= 209.2479 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 396.5522 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1261 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3416 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2903 (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	0.3412	0.3194	0.3194	0.2903	0.2976	0.2831	0.2831	0.2758	0.2758	0.2976	0.2903	0.2976 (22b)
Effective ac	0.5582	0.5510	0.5510	0.5422	0.5443	0.5401	0.5401	0.5380	0.5380	0.5443	0.5422	0.5443 (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)			29.5100	1.1450	33.7901		(27)
Ground Floor			78.3700	0.1200	9.4044	84.0000	6583.0800 (28a)
Brick and Block	205.1800	31.6300	173.5500	0.2400	41.6520	42.2200	7327.2810 (29a)
Pitched Roof	78.3700		78.3700	0.1000	7.8370	9.1000	713.1670 (30)
Total net area of external elements Aum(A, m ²)			361.9200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.0155		(33)
GF Block			76.3200			75.0000	5724.0000 (32c)
GF Stud			27.4300			9.0000	246.8700 (32c)
FF Stud			176.4600			9.0000	1588.1400 (32c)
Internal Floor 1			78.3700			18.0000	1410.6600 (32d)
Internal Ceiling 1			78.3700			18.0000	1410.6600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25003.8580 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.5244 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9191 (36)
Total fabric heat loss (33) + (36) = 100.9346 (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	73.0466	72.1055	72.1055	70.9471	71.2264	70.6748	70.6748	70.4093	70.4093	71.2264	70.9471	71.2264 (38)
Heat transfer coeff	173.9812	173.0401	173.0401	171.8817	172.1610	171.6094	171.6094	171.3439	171.3439	172.1610	171.8817	172.1610 (39)
Average = Sum(39)m / 12 =												172.1845 (39)
HLP	1.1100	1.1040	1.1040	1.0966	1.0984	1.0949	1.0949	1.0932	1.0932	1.0984	1.0966	1.0984 (40)
HLP (average)												1.0985 (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												2.9443 (42)
Average daily hot water use (litres/day)												104.1264 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5390	110.3740	106.2089	102.0439	97.8788	93.7138	93.7138	97.8788	102.0439	106.2089	110.3740	114.5390 (44)
Energy conte	169.8581	148.5590	153.2996	133.6503	128.2406	110.6619	102.5445	117.6713	119.0767	138.7724	151.4809	164.4985 (45)
Energy content (annual)										Total = Sum(45)m =		1638.3138 (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	25.4787	22.2838	22.9949	20.0475	19.2361	16.5993	15.3817	17.6507	17.8615	20.8159	22.7221	24.6748 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
18.8578 17.0329 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 (57)												
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
211.9783 186.6030 194.0240 167.6582 157.5665 138.8167 131.6378 147.6951 154.4353 179.4969 192.2424 206.6187 (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												1.2367 (H8)
Utilisation factor												0.5545 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												104.1264 (H14)
Volume ratio Veff/V												1.1236 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-987.8984 (H17)
Solar input	-32.2364	-45.8438	-79.5507	-107.0092	-124.3519	-135.2588	-128.2459	-116.9479	-91.5348	-63.2656	-38.1283	-25.5253 (63)
Solar input (sum of months) = Sum (63)m =												-987.8984 (63)
Output from w/h												
179.7419 140.7593 114.4733 60.6490 33.2146 3.5579 3.3919 30.7472 62.9005 116.2313 154.1141 181.0934 (64)												
Total per year (kWh/year) = Sum (64)m =												1080.8744 (64)
Heat gains from water heating, kWh/month												
90.1740 79.8311 83.5517 71.6450 66.1007 59.3189 57.3707 63.1447 67.8799 78.7214 82.9766 88.3919 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562	176.6562 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
74.1108 65.8246 53.5321 40.5273 30.2946 25.5760 27.6357 35.9220 48.2144 61.2193 71.4519 76.1706 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
489.1978 494.2741 481.4819 454.2488 419.8719 387.5624 365.9777 360.9014 373.6936 400.9267 435.3036 467.6131 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 55.6099 (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)												
-117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 -117.7708 (71)												
Water heating gains (Table 5)												
121.2016 118.7963 112.3006 99.5070 88.8450 82.3874 77.1111 84.8719 94.2776 105.8083 115.2453 118.8063 (72)												
Total internal gains	802.0054	796.3902	764.8099	711.7783	656.5068	613.0210	588.2198	599.1906	633.6809	685.4496	739.4961	780.0853 (73)

6. Solar gains

[Jan]														
	Area				Solar flux		g		FF		Access		Gains	
	m2				Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
North	16.8400				13.4684		0.6300		0.7000		0.7700		69.3155 (74)	
East	2.1700				25.1733		0.6300		0.7000		0.7700		16.6944 (76)	
South	9.5400				56.5862		0.6300		0.7000		0.7700		164.9798 (78)	
West	0.9600				25.1733		0.6300		0.7000		0.7700		7.3855 (80)	

Solar gains	258.3753	383.3287	563.3614	758.9623	854.9770	967.1587	884.6351	801.3833	658.1368	464.9751	310.1617	208.3596 (83)		
Total gains	1060.3807	1179.7189	1328.1713	1470.7406	1511.4838	1580.1797	1472.8550	1400.5739	1291.8177	1150.4247	1049.6579	988.4449 (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	39.9211	40.1382	40.1382	40.4087	40.3432	40.4728	40.4728	40.5355	40.5355	40.3432	40.4087	40.3432
alpha	3.6614	3.6759	3.6759	3.6939	3.6895	3.6982	3.6982	3.7024	3.7024	3.6895	3.6939	3.6895
util living area												
	0.9794	0.9692	0.9405	0.8705	0.7434	0.5242	0.3775	0.3840	0.6584	0.8829	0.9615	0.9830 (86)
MIT	19.6087	19.7666	20.0916	20.4952	20.7989	20.9601	20.9912	20.9911	20.9072	20.5607	20.0452	19.5861 (87)
Th 2	19.9927	19.9976	19.9976	20.0036	20.0022	20.0050	20.0050	20.0064	20.0064	20.0022	20.0036	20.0022 (88)
util rest of house												
	0.9747	0.9622	0.9269	0.8404	0.6839	0.4331	0.2670	0.2684	0.5684	0.8473	0.9511	0.9791 (89)
MIT 2	18.1664	18.3967	18.8603	19.4225	19.8095	19.9799	20.0022	20.0037	19.9379	19.5217	18.8051	18.1404 (90)
Living area fraction												
									fLA = Living area / (4) =			0.1786 (91)
MIT	18.4240	18.6414	19.0802	19.6141	19.9862	20.1550	20.1788	20.1800	20.1109	19.7072	19.0265	18.3986 (92)
Temperature adjustment												0.0000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

adjusted MIT 18.4240 18.6414 19.0802 19.6141 19.9862 20.1550 20.1788 20.1800 20.1109 19.7072 19.0265 18.3986 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9645	0.9496	0.9110	0.8266	0.6828	0.4474	0.2867	0.2890	0.5787	0.8346	0.9375	0.9700	(94)
Useful gains	1022.6844	1120.2403	1209.9659	1215.6707	1032.0688	706.9670	422.3217	404.7944	747.5621	960.0983	984.0502	958.7739	(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	2231.1316	2187.4634	1986.5395	1635.2934	1185.5377	730.1923	425.3931	407.8031	807.1922	1309.6656	1792.1326	2186.2054	(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	899.0847	717.1740	577.7707	302.1283	114.1809	0.0000	0.0000	0.0000	0.0000	260.0781	581.8193	913.2090	(98)
Space heating												4365.4450	(98)
Space heating per m2											(98) / (4) =	27.8515	(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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4823.6961 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	899.0847	717.1740	577.7707	302.1283	114.1809	0.0000	0.0000	0.0000	0.0000	260.0781	581.8193	913.2090	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	993.4637	792.4574	638.4207	333.8434	126.1667	0.0000	0.0000	0.0000	0.0000	287.3791	642.8943	1009.0707	(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	179.7419	140.7593	114.4733	60.6490	33.2146	3.5579	3.3919	30.7472	62.9005	116.2313	154.1141	181.0934	(64)
Efficiency of water heater (217)m	88.5224	88.5519	88.5369	88.5158	87.8457	79.8000	79.8000	79.8000	79.8000	86.9010	88.0282	88.5354	(216)
Fuel for water heating, kWh/month	203.0467	158.9567	129.2945	68.5177	37.8102	4.4585	4.2504	38.5304	78.8227	133.7514	175.0735	204.5434	(219)
Water heating fuel used												1237.0562	(219)
Annual totals kWh/year													
Space heating fuel - main system												4823.6961	(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)													523.5279 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 1184 * 1.00) =										-918.7195		-918.7195	(233)
Total delivered energy for all uses												5790.5607	(238)

10a. Fuel costs - using BEDF prices (500)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4823.6961	3.6300	175.1002 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	1237.0562	3.6300	44.9051 (247)	
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)	
Pump for solar water heating	50.0000	19.4400	9.7200 (249)	
Energy for lighting	523.5279	19.4400	101.7738 (250)	
Additional standing charges			95.0000 (251)	
Energy saving/generation technologies				
PV Unit	-918.7195	19.4400	-178.5991 (252)	
Total energy cost			262.4801 (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	4823.6961	0.2160	1041.9184 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	
Water heating (other fuel)	1237.0562	0.2160	267.2041 (264)	
Space and water heating			1309.1225 (265)	
Pumps and fans	125.0000	0.5190	64.8750 (267)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy for lighting	523.5279	0.5190	271.7110 (268)
Energy saving/generation technologies			
PV Unit	-918.7195	0.5190	-476.8154 (269)
Total kg/year			1168.8931 (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	4823.6961	1.2200	5884.9093 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1237.0562	1.2200	1509.2085 (264)
Space and water heating			7394.1178 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	523.5279	3.0700	1607.2308 (268)
Energy saving/generation technologies			
PV Unit	-918.7195	3.0700	-2820.4690 (269)
Primary energy kWh/year			6564.6296 (272)
Primary energy kWh/m2/year			41.8823 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 13	Issued on Date	26/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Project	14 Oram Way, West End, SOUTHAMPTON, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.45	TER	15.91
Environmental	88 B	% DER<TER	21.73		
CO ₂ Emissions (t/year)	1.44	DFEE	45.72	TFEE	57.52
General Requirements Compliance	Pass	% DFEE<TFEE	20.52		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Earthwool Loft Roll 40						
	Main construction	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 13	Issued on Date	26/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Project	14 Oram Way, West End, SOUTHAMPTON, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.45	TER	15.91
Environmental	88 B	% DER<TER	21.73		
CO ₂ Emissions (t/year)	1.44	DFEE	45.72	TFEE	57.52
General Requirements Compliance	Pass	% DFEE<TFEE	20.52		

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

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 13	Issued on Date	26/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Project	14 Oram Way, West End, SOUTHAMPTON, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.45	TER	15.91
Environmental	88 B	% DER<TER	21.73		
CO ₂ Emissions (t/year)	1.44	DFEE	45.72	TFEE	57.52
General Requirements Compliance	Pass	% DFEE<TFEE	20.52		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 35.11 m², Perimeter = 16.79 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 13	Issued on Date	26/07/2022
Assessment Reference	As Built	Prop Type Ref	F
Property	14 Oram Way, West End, SOUTHAMPTON, SO30 3JW		
SAP Rating	89 B	DER	12.45
Environmental	88 B	TER	15.91
CO ₂ Emissions (t/year)	1.44	% DER<TER	21.73
General Requirements Compliance	Pass	DFEE	45.72
		TFEE	57.52
		% DFEE<TFEE	20.52
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	South
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	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	40.55 m	78.37 m ²	2.39 m
	1st Storey:	40.55 m	78.37 m ²	2.67 m

7.0 Living Area	27.99	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	159.52	kJ/m ² K

9.0 External Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	205.18	173.55

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

9.2 Internal Walls				
Description	Construction	Kappa (kJ/m ² K)	Area (m ²)	
GF Block	Dense block, plasterboard on dabs	75.00	76.32	
GF Stud	Plasterboard on timber frame	9.00	27.43	
FF Stud	Plasterboard on timber frame	9.00	176.46	

10.0 External Roofs					
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	78.37

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	78.37

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	78.37

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	78.37

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	South							2.12	
Front Shaded	Window	[1] Brick and Block	South	None	1.17	Yes				1.92	
Front Elevation	Window	[1] Brick and Block	South	None	0.00					7.62	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					2.17	
North Elevation	Window	[1] Brick and Block	North	None	0.00					16.84	
Side Elevation	Window	[1] Brick and Block	West	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)	2.52	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	9.15	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.54	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	5.54	0.056	No	Birtley Supatherm
Independently assessed	E3 Sill	15.22	0.021	No	Knauf P5
Independently assessed	E4 Jamb	50.10	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	40.55	0.022	No	Knauf P10 Average Value
Independently assessed	E6 Intermediate floor within a dwelling	40.55	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	25.65	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	15.01	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	30.30	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	10.10	-0.091	No	Knauf P24

Y-value	0.016	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.31	m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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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				5
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	26	
Total number of L.E.L. fittings	26	
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

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	18911	
Fuel Type	Mains gas	
Main Heating	BGB	
SAP Code	102	
In Winter	90.5	
In Summer	79.8	
Controls	CBI Time and temperature zone control	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2110	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	

25.0 Main Heating 2

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	Hot Water Cylinder			
Cylinder Stat	Yes			
Cylinder In Heated Space	Yes			
Independent Time Control	Yes			
Insulation Type	Measured Loss			
Cylinder Volume	215.00	L		
Loss	1.73	kWh/day		
Pipes insulation	Fully insulated primary pipework			
31.0 Thermal Store	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.97	South	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	£40	B 90	