



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 7 Oram Way
WEST END, SO30 3JW

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 16/02/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 7	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO+)
Property	7 Oram Way, WEST END, SO30 3JW		
SAP Rating	87 B	DER	14.40
Environmental	89 B	% DER<TER	20.30
CO ₂ Emissions (t/year)	0.89	DFEE	43.52
General Requirements Compliance	Pass	% DFEE<TFEE	16.50
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
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)	18.07	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.40	kgCO ₂ /m ²	Pass
	-3.67 (-20.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.12	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.52	kWh/m ² /yr	
	-8.6 (-16.5%)	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	4.08 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

4.47 m², No overhang

Windows facing South

1.92 m², No overhang

Windows facing West

8.18 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00 W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00 W/m²K

Roof U-value

0.10 W/m²K

Floor U-value

0.12 W/m²K

Door U-value

1.10 W/m²K

Photovoltaic array

0.73 kW

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THERMAL BRIDGING

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CO ₂ Emissions (t/year)	0.89	DFEE	43.52	TFEE	52.12
General Requirements Compliance	Pass	% DFEE<TFEE	16.50		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.098	1.12	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	1.01	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	7.20	0.31	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.060	3.58	0.21	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.034	10.39	0.35	CD0027
External wall	E4 Jamb	Independently assessed	0.039	28.50	1.11	CD0028
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	18.46	2.95	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.46	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.70	0.58	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.78	0.47	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	10.10	0.51	CD0035
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	10.10	0.61	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.78	1.40	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.78	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.049	8.78	0.43	CD0020

Total: **9.11** W/mK:
Y-Value: **0.051** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	0.89	DFEE	43.52	TFEE	52.12
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Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Semi-Detached House, total floor area 85 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.07 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.40 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 43.5 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: 4.08 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading:
Average
Windows facing East: 4.47 m², No overhang
Windows facing South: 1.92 m², No overhang
Windows facing West: 8.18 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 0.73 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	42.5600 (1b)	x 2.3900 (2b)	= 101.7184 (1b) - (3b)
First floor	42.5600 (1c)	x 2.6700 (2c)	= 113.6352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3536 (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) = 0.1857 (8)
Pressure test					Yes
Measured/design AP50					4.0800
Infiltration rate					0.3897 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3605 (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	0.4597	0.4506	0.4416	0.3966	0.3875	0.3425	0.3425	0.3335	0.3605	0.3875	0.4056	0.4236 (22b)
Effective ac	0.6056	0.6015	0.5975	0.5786	0.5751	0.5586	0.5586	0.5556	0.5650	0.5751	0.5822	0.5897 (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)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5600	0.1200	5.1072	84.0000	3575.0400 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5600		42.5600	0.1000	4.2560	9.1000	387.2960 (30)
Total net area of external elements Aum(A, m ²)			178.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7912		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5600			18.0000	766.0800 (32d)
Internal Ceiling 1			42.5600			18.0000	766.0800 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	43.0408	42.7493	42.4635	41.1214	40.8702	39.7013	39.7013	39.4848	40.1515	40.8702	41.3782	41.9093 (38)
Heat transfer coeff	98.9402	98.6487	98.3629	97.0208	96.7696	95.6007	95.6007	95.3842	96.0509	96.7696	97.2776	97.8087 (39)
Average = Sum(39)m / 12 =												97.0195 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1624	1.1589	1.1556	1.1398	1.1369	1.1231	1.1231	1.1206	1.1284	1.1369	1.1428	1.1491 (40)
HLP (average)												1.1398 (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												2.5529 (42)
Average daily hot water use (litres/day)												94.8306 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.3137	100.5205	96.7272	92.9340	89.1408	85.3476	85.3476	89.1408	92.9340	96.7272	100.5205	104.3137 (44)
Energy conte	154.6942	135.2965	139.6139	121.7188	116.7921	100.7827	93.3900	107.1663	108.4462	126.3836	137.9576	149.8131 (45)
Energy content (annual)										Total = Sum(45)m =		1492.0550 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.2041	20.2945	20.9421	18.2578	17.5188	15.1174	14.0085	16.0750	16.2669	18.9575	20.6936	22.4720 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5596	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5108	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645 (64)
Heat gains from water heating, kWh/month	58.3257	51.2087	53.3047	47.1251	45.7033	40.1523	37.9118	42.4991	42.7068	48.9003	52.5350	56.7007 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1815.9160 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.1042	18.7445	15.2441	11.5408	8.6269	7.2832	7.8697	10.2293	13.7298	17.4331	20.3470	21.6907 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.8082	232.1929	226.1836	213.3904	197.2413	182.0634	171.9237	169.5390	175.5483	188.3415	204.4906	219.6685 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643 (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)	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147 (71)
Water heating gains (Table 5)	78.3948	76.2034	71.6462	65.4516	61.4292	55.7671	50.9567	57.1225	59.3149	65.7261	72.9653	76.2106 (72)
Total internal gains	393.6002	391.4339	377.3669	354.6757	331.5904	309.4068	295.0431	301.1839	312.8861	335.7938	362.0959	381.8629 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East				4.4700	19.6403		0.6300	0.7000	0.7700		26.8304 (76)	
South				1.9200	46.7521		0.6300	0.7000	0.7700		27.4330 (78)	
West				8.1800	19.6403		0.6300	0.7000	0.7700		49.0990 (80)	
Solar gains	103.3624	193.4622	301.8448	421.4382	504.6206	512.4362	489.4831	427.5669	344.2806	224.7073	127.1925	86.1453 (83)
Total gains	496.9626	584.8960	679.2117	776.1140	836.2110	821.8430	784.5262	728.7508	657.1667	560.5011	489.2884	468.0081 (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	37.7281	37.8396	37.9495	38.4745	38.5744	39.0460	39.0460	39.1346	38.8630	38.5744	38.3729	38.1646
alpha	3.5152	3.5226	3.5300	3.5650	3.5716	3.6031	3.6031	3.6090	3.5909	3.5716	3.5582	3.5443
util living area	0.9897	0.9811	0.9604	0.9087	0.8090	0.6560	0.5083	0.5596	0.7855	0.9412	0.9827	0.9916 (86)
MIT	19.1990	19.4243	19.7968	20.2684	20.6509	20.8861	20.9657	20.9514	20.7705	20.2519	19.6409	19.1638 (87)
Th 2	19.9502	19.9530	19.9557	19.9685	19.9708	19.9820	19.9820	19.9841	19.9777	19.9708	19.9660	19.9610 (88)
util rest of house	0.9874	0.9769	0.9514	0.8873	0.7638	0.5771	0.4020	0.4524	0.7193	0.9230	0.9782	0.9898 (89)
MIT 2	18.3087	18.5339	18.9027	19.3671	19.7183	19.9189	19.9696	19.9649	19.8339	19.3624	18.7604	18.2817 (90)
Living area fraction									fLA = Living area / (4) =			0.2122 (91)
MIT	18.4976	18.7228	19.0924	19.5583	19.9162	20.1241	20.1809	20.1742	20.0326	19.5511	18.9472	18.4689 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4976	18.7228	19.0924	19.5583	19.9162	20.1241	20.1809	20.1742	20.0326	19.5511	18.9472	18.4689 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	488.5599	567.5836	639.8342	680.7885	636.4785	483.9865	332.3955	345.1335	475.3615	512.0940	475.6573	461.4908 (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	1404.7125	1363.6036	1238.6265	1034.0778	795.0791	528.1060	342.3370	360.0028	569.8354	866.1969	1152.4659	1395.6200 (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	681.6175	534.9255	445.5015	254.3683	117.9989	0.0000	0.0000	0.0000	0.0000	263.4526	487.3021	694.9922 (98)
Space heating												3480.1586 (98)
Space heating per m2												(98) / (4) = 40.8853 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3836.9996 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	681.6175	534.9255	445.5015	254.3683	117.9989	0.0000	0.0000	0.0000	0.0000	263.4526	487.3021	694.9922	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	751.5077	589.7745	491.1814	280.4502	130.0980	0.0000	0.0000	0.0000	0.0000	290.4659	537.2681	766.2538	(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	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645	(64)
Efficiency of water heater (217)m	90.0945	90.0390	89.9185	89.6481	89.1381	87.9000	87.9000	87.9000	87.9000	89.6470	89.9763	87.9000	(216)
Fuel for water heating, kWh/month	202.2917	177.9082	185.8865	165.4617	161.8523	144.8818	137.4612	153.1646	153.6289	171.6671	182.9526	196.8172	(219)
Water heating fuel used												2033.9737	(219)
Annual totals kWh/year													
Space heating fuel - main system												3836.9996	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												372.7064	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 908 * 1.00) =										-530.1869		-530.1869	(233)
Total delivered energy for all uses												5788.4928	(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	3836.9996	0.2160	828.7919 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2033.9737	0.2160	439.3383 (264)
Space and water heating			1268.1302 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.7064	0.5190	193.4346 (268)
Energy saving/generation technologies			
PV Unit	-530.1869	0.5190	-275.1670 (269)
Total CO2, kg/year			1225.3229 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.4000 (273)

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

DER		14.4000	ZC1
Total Floor Area	TFA	85.1200	
Assumed number of occupants	N	2.5529	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.9985	ZC2
CO2 emissions from cooking, equation (L16)		2.1178	ZC3
Total CO2 emissions		32.5164	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		32.5164	ZC8

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Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5600 (1b)	x 2.3900 (2b)	= 101.7184 (1b) - (3b)
First floor	42.5600 (1c)	x 2.6700 (2c)	= 113.6352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3536 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1393 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3893 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3601 (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	0.4591	0.4501	0.4411	0.3961	0.3871	0.3421	0.3421	0.3331	0.3601	0.3871	0.4051	0.4231 (22b)
Effective ac	0.6054	0.6013	0.5973	0.5785	0.5749	0.5585	0.5585	0.5555	0.5648	0.5749	0.5821	0.5895 (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)			14.5700	1.3258	19.3163		(27)
Ground Floor			42.5600	0.1300	5.5328		(28a)
Brick and Block	93.4100	16.6900	76.7200	0.1800	13.8096		(29a)
Pitched Roof	42.5600		42.5600	0.1300	5.5328		(30)
Total net area of external elements Aum(A, m ²)			178.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.3115		(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)							9.9234 (36)
Total fabric heat loss						(33) + (36) =	56.2349 (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	43.0240	42.7332	42.4480	41.1089	40.8583	39.6920	39.6920	39.4760	40.1412	40.8583	41.3652	41.8951 (38)
Heat transfer coeff	99.2589	98.9680	98.6829	97.3438	97.0932	95.9268	95.9268	95.7108	96.3761	97.0932	97.6001	98.1300 (39)
Average = Sum(39)m / 12 =												97.3426 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1661	1.1627	1.1593	1.1436	1.1407	1.1270	1.1270	1.1244	1.1322	1.1407	1.1466	1.1528 (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												2.5529 (42)
Average daily hot water use (litres/day)												94.8306 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.3137	100.5205	96.7272	92.9340	89.1408	85.3476	85.3476	89.1408	92.9340	96.7272	100.5205	104.3137 (44)
Energy conte	154.6942	135.2965	139.6139	121.7188	116.7921	100.7827	93.3900	107.1663	108.4462	126.3836	137.9576	149.8131 (45)
Energy content (annual)												Total = Sum(45)m = 1492.0550 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2041	20.2945	20.9421	18.2578	17.5188	15.1174	14.0085	16.0750	16.2669	18.9575	20.6936	22.4720 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.2911	45.8305	45.4252	42.0892	43.4922	45.4252	45.8305	49.2911	49.3151	50.9589 (61)
Solar input	205.6531	181.3239	188.9050	167.5492	162.2172	142.8719	136.8821	152.5915	154.2767	175.6748	187.2727	200.7720 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	205.6531	181.3239	188.9050	167.5492	162.2172	142.8719	136.8821	152.5915	154.2767	175.6748	187.2727	200.7720 (64)
	64.1755	56.4929	58.7444	51.9291	50.1897	44.0325	41.9252	46.9891	47.5160	54.3453	58.1997	62.5526 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.1042	18.7445	15.2441	11.5408	8.6269	7.2832	7.8697	10.2293	13.7298	17.4331	20.3470	21.6907	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.8082	232.1929	226.1836	213.3904	197.2413	182.0634	171.9237	169.5390	175.5483	188.3415	204.4906	219.6685	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	(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)	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	(71)
Water heating gains (Table 5)	86.2575	84.0669	78.9575	72.1238	67.4592	61.1563	56.3511	63.1574	65.9944	73.0448	80.8329	84.0760	(72)
Total internal gains	401.4629	399.2974	384.6782	361.3479	337.6204	314.7959	300.4375	307.2188	319.5656	343.1125	369.9636	389.7283	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
East				4.4700	19.6403		0.6300	0.7000	0.7700		26.8304 (76)		
South				1.9200	46.7521		0.6300	0.7000	0.7700		27.4330 (78)		
West				8.1800	19.6403		0.6300	0.7000	0.7700		49.0990 (80)		

Solar gains	103.3624	193.4622	301.8448	421.4382	504.6206	512.4362	489.4831	427.5669	344.2806	224.7073	127.1925	86.1453	(83)
Total gains	504.8253	592.7595	686.5230	782.7862	842.2410	827.2321	789.9206	734.7857	663.8462	567.8198	497.1560	475.8735	(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	59.5524	59.7275	59.9000	60.7241	60.8808	61.6210	61.6210	61.7601	61.3338	60.8808	60.5646	60.2376	
alpha	4.9702	4.9818	4.9933	5.0483	5.0587	5.1081	5.1081	5.1173	5.0889	5.0587	5.0376	5.0158	
util living area	0.9981	0.9954	0.9865	0.9534	0.8626	0.6924	0.5240	0.5809	0.8365	0.9755	0.9960	0.9986	(86)
MIT	19.7307	19.8955	20.1699	20.5233	20.8050	20.9544	20.9909	20.9851	20.8786	20.4961	20.0489	19.7060	(87)
Th 2	19.9472	19.9500	19.9527	19.9654	19.9678	19.9789	19.9789	19.9809	19.9746	19.9678	19.9629	19.9579	(88)
util rest of house	0.9975	0.9939	0.9817	0.9362	0.8143	0.6014	0.4078	0.4614	0.7629	0.9632	0.9943	0.9981	(89)
MIT 2	18.2561	18.4984	18.8983	19.4083	19.7785	19.9489	19.9756	19.9749	19.8778	19.3808	18.7322	18.2275	(90)
Living area fraction	18.5689	18.7948	19.1681	19.6449	19.9963	20.1623	20.1910	20.1892	20.0901	19.6174	19.0116	18.5412	(91)
MIT	18.5689	18.7948	19.1681	19.6449	19.9963	20.1623	20.1910	20.1892	20.0901	19.6174	19.0116	18.5412	(92)
Temperature adjustment	18.5689	18.7948	19.1681	19.6449	19.9963	20.1623	20.1910	20.1892	20.0901	19.6174	19.0116	18.5412	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	502.8937	587.6299	670.5625	727.6320	687.0909	511.9156	341.6561	357.6514	512.7605	543.7519	493.1912	474.5028	(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	1416.3196	1375.1418	1250.1233	1045.9500	805.5113	533.5703	344.4747	362.6704	577.3037	875.5322	1162.5731	1407.3036	(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	679.5889	529.2080	431.1933	229.1890	88.1048	0.0000	0.0000	0.0000	0.0000	246.8445	481.9549	694.0038	(98)
Space heating												3380.0871	(98)
Space heating per m2												39.7097	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3618.9369 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	679.5889	529.2080	431.1933	229.1890	88.1048	0.0000	0.0000	0.0000	0.0000	246.8445	481.9549	694.0038	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	727.6112	566.6038	461.6630	245.3843	94.3306	0.0000	0.0000	0.0000	0.0000	264.2875	516.0117	743.0447	(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	205.6531	181.3239	188.9050	167.5492	162.2172	142.8719	136.8821	152.5915	154.2767	175.6748	187.2727	200.7720	(64)
Efficiency of water heater (217)m	87.8335	87.5886	87.0640	85.8403	83.5869	80.3000	80.3000	80.3000	80.3000	85.9074	87.3264	80.3000	(216)
Fuel for water heating, kWh/month	234.1397	207.0178	216.9726	195.1871	194.0701	177.9226	170.4634	190.0268	192.1254	204.4932	214.4515	228.3609	(219)
Water heating fuel used												2425.2312	(219)
Annual totals kWh/year													
Space heating fuel - main system												3618.9369	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												372.7064	(232)
Total delivered energy for all uses												6491.8745	(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	3618.9369	0.2160	781.6904 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2425.2312	0.2160	523.8499 (264)
Space and water heating			1305.5403 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.7064	0.5190	193.4346 (268)
Total CO2, kg/m2/year			1537.8999 (272)
Emissions per m2 for space and water heating			15.3376 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2725 (272b)
Emissions per m2 for pumps and fans			0.4573 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3376 * 1.00) + 2.2725 + 0.4573, rounded to 2 d.p.			18.0700 (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	42.5600 (1b)	x 2.3900 (2b)	= 101.7184 (1b) - (3b)
First floor	42.5600 (1c)	x 2.6700 (2c)	= 113.6352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3536 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1393 (8)
Pressure test					Yes
Measured/design AP50					4.0800
Infiltration rate					0.3433 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3176 (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	0.4049	0.3969	0.3890	0.3493	0.3414	0.3017	0.3017	0.2937	0.3176	0.3414	0.3573	0.3731 (22b)
Effective ac	0.5820	0.5788	0.5757	0.5610	0.5583	0.5455	0.5455	0.5431	0.5504	0.5583	0.5638	0.5696 (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)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5600	0.1200	5.1072	84.0000	3575.0400 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5600		42.5600	0.1000	4.2560	9.1000	387.2960 (30)
Total net area of external elements Aum(A, m ²)			178.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7912		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5600			18.0000	766.0800 (32d)
Internal Ceiling 1			42.5600			9.0000	383.0400 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) =	13055.1344 (34)
	153.3733 (35)
	9.1082 (36)
(33) + (36) =	55.8994 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 41.3584 Feb 41.1322 Mar 40.9105 Apr 39.8691 May 39.6743 Jun 38.7673 Jul 38.7673 Aug 38.5993 Sep 39.1166 Oct 39.6743 Nov 40.0684 Dec 40.4805 (38)
Heat transfer coeff	97.2578 97.0316 96.8099 95.7685 95.5737 94.6667 94.6667 94.4987 95.0160 95.5737 95.9678 96.3799 (39)
Average = Sum(39)m / 12 =	95.7676 (39)

HLP	Jan 1.1426 Feb 1.1399 Mar 1.1373 Apr 1.1251 May 1.1228 Jun 1.1122 Jul 1.1122 Aug 1.1102 Sep 1.1163 Oct 1.1228 Nov 1.1274 Dec 1.1323 (40)
HLP (average)	1.1251 (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												2.5529 (42)
Average daily hot water use (litres/day)												94.8306 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.3137	100.5205	96.7272	92.9340	89.1408	85.3476	85.3476	89.1408	92.9340	96.7272	100.5205	104.3137 (44)
Energy conte	154.6942	135.2965	139.6139	121.7188	116.7921	100.7827	93.3900	107.1663	108.4462	126.3836	137.9576	149.8131 (45)
Energy content (annual)										Total = Sum(45)m =	1492.0550 (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	32.8725	28.7505	29.6680	25.8652	24.8183	21.4163	19.8454	22.7728	23.0448	26.8565	29.3160	31.8353 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.1042	18.7445	15.2441	11.5408	8.6269	7.2832	7.8697	10.2293	13.7298	17.4331	20.3470	21.6907	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.8082	232.1929	226.1836	213.3904	197.2413	182.0634	171.9237	169.5390	175.5483	188.3415	204.4906	219.6685	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	(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)	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	(71)
Water heating gains (Table 5)	44.1835	42.7835	39.8763	35.9239	33.3579	29.7449	26.6739	30.6087	32.0067	36.0975	40.7167	42.7893	(72)
Total internal gains	356.3889	355.0140	342.5970	322.1481	300.5191	280.3845	267.7603	271.6700	282.5779	303.1652	326.8473	345.4416	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d					Gains W
East					4.4700	19.6403	0.6300	0.7000	0.7700					26.8304 (76)
South					1.9200	46.7521	0.6300	0.7000	0.7700					27.4330 (78)
West					8.1800	19.6403	0.6300	0.7000	0.7700					49.0990 (80)
Solar gains	103.3624	193.4622	301.8448	421.4382	504.6206	512.4362	489.4831	427.5669	344.2806	224.7073	127.1925			86.1453 (83)
Total gains	459.7513	548.4761	644.4418	743.5864	805.1397	792.8207	757.2434	699.2370	626.8584	527.8725	454.0398			431.5869 (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	37.2867	37.3737	37.4592	37.8666	37.9438	38.3073	38.3073	38.3754	38.1665	37.9438	37.7879	37.6264	
alpha	3.4858	3.4916	3.4973	3.5244	3.5296	3.5538	3.5538	3.5584	3.5444	3.5296	3.5192	3.5084	
util living area	0.9912	0.9831	0.9634	0.9133	0.8161	0.6661	0.5184	0.5727	0.7971	0.9467	0.9850	0.9929	(86)
MIT	19.1399	19.3703	19.7520	20.2329	20.6291	20.8752	20.9615	20.9451	20.7500	20.2092	19.5828	19.0995	(87)
Th 2	19.9662	19.9683	19.9705	19.9804	19.9822	19.9909	19.9909	19.9925	19.9876	19.9822	19.9785	19.9746	(88)
util rest of house	0.9892	0.9794	0.9551	0.8932	0.7726	0.5883	0.4121	0.4657	0.7336	0.9303	0.9811	0.9913	(89)
MIT 2	18.2647	18.4949	18.8728	19.3455	19.7109	19.9205	19.9766	19.9703	19.8280	19.3332	18.7152	18.2307	(90)
Living area fraction	18.4504	18.6807	19.0594	19.5338	19.9057	20.1230	20.1856	20.1771	20.0236	19.5190	18.8993	18.4150	(91)
Temperature adjustment	18.4504	18.6807	19.0594	19.5338	19.9057	20.1230	20.1856	20.1771	20.0236	19.5190	18.8993	18.4150	(92)
adjusted MIT	18.4504	18.6807	19.0594	19.5338	19.9057	20.1230	20.1856	20.1771	20.0236	19.5190	18.8993	18.4150	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	453.0011	533.8020	609.5448	656.3221	619.0534	475.1295	328.3292	340.1829	461.4778	486.0732	442.9516	426.4218	(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	1376.2356	1337.1599	1215.8714	1018.3812	784.2526	522.8460	339.4323	356.9295	562.8395	852.4251	1132.3491	1370.0425	(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	686.8865	539.8565	451.1070	260.6825	122.9082	0.0000	0.0000	0.0000	0.0000	272.5658	496.3663	702.0538	(98)
Space heating												3532.4265	(98)
Space heating per m2												41.4994	(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	889.8666	700.5333	718.1901	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8312	0.8893	0.8634	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	739.6199	622.9897	620.0883	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1022.5681	979.0012	912.9063	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	203.7227	264.8726	217.8566	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												686.4518 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	50.9307	66.2181	54.4641	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												171.6130 (107)
Space cooling per m2												2.0161 (108)
Energy for space heating												41.4994 (99)
Energy for space cooling												2.0161 (108)
Total												43.5155 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.5 (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	42.5600 (1b)	x 2.3900 (2b)	= 101.7184 (1b) - (3b)
First floor	42.5600 (1c)	x 2.6700 (2c)	= 113.6352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3536 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							3 * 10 =	30.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						30.0000 / (5) =	0.1393 (8)				
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.3893 (18)					
Number of sides sheltered							1 (19)					
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.3601 (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	0.4591	0.4501	0.4411	0.3961	0.3871	0.3421	0.3421	0.3331	0.3601	0.3871	0.4051	0.4231 (22b)
Effective ac	0.6054	0.6013	0.5973	0.5785	0.5749	0.5585	0.5585	0.5555	0.5648	0.5749	0.5821	0.5895 (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)			14.5700	1.3258	19.3163		(27)					
Ground Floor			42.5600	0.1300	5.5328		(28a)					
Brick and Block	93.4100	16.6900	76.7200	0.1800	13.8096		(29a)					
Pitched Roof	42.5600		42.5600	0.1300	5.5328		(30)					
Total net area of external elements Aum(A, m2)			178.5300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.3115		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9234 (36)					
Total fabric heat loss						(33) + (36) =	56.2349 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.0240	Feb 42.7332	Mar 42.4480	Apr 41.1089	May 40.8583	Jun 39.6920	Jul 39.6920	Aug 39.4760	Sep 40.1412	Oct 40.8583	Nov 41.3652	Dec 41.8951 (38)
Heat transfer coeff	99.2589	98.9680	98.6829	97.3438	97.0932	95.9268	95.9268	95.7108	96.3761	97.0932	97.6001	98.1300 (39)
Average = Sum(39)m / 12 =												97.3426 (39)
HLP	Jan 1.1661	Feb 1.1627	Mar 1.1593	Apr 1.1436	May 1.1407	Jun 1.1270	Jul 1.1270	Aug 1.1244	Sep 1.1322	Oct 1.1407	Nov 1.1466	Dec 1.1528 (40)
HLP (average)												1.1436 (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												2.5529 (42)
Average daily hot water use (litres/day)												94.8306 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.3137	100.5205	96.7272	92.9340	89.1408	85.3476	85.3476	89.1408	92.9340	96.7272	100.5205	104.3137 (44)
Energy conte	154.6942	135.2965	139.6139	121.7188	116.7921	100.7827	93.3900	107.1663	108.4462	126.3836	137.9576	149.8131 (45)
Energy content (annual)											Total = Sum(45)m =	1492.0550 (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)
	32.8725	28.7505	29.6680	25.8652	24.8183	21.4163	19.8454	22.7728	23.0448	26.8565	29.3160	31.8353 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434	127.6434 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.1042	18.7445	15.2441	11.5408	8.6269	7.2832	7.8697	10.2293	13.7298	17.4331	20.3470	21.6907 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.8082	232.1929	226.1836	213.3904	197.2413	182.0634	171.9237	169.5390	175.5483	188.3415	204.4906	219.6685 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643	35.7643 (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)	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147 (71)
Water heating gains (Table 5)	44.1835	42.7835	39.8763	35.9239	33.3579	29.7449	26.6739	30.6087	32.0067	36.0975	40.7167	42.7893 (72)
Total internal gains	356.3889	355.0140	342.5970	322.1481	300.5191	280.3845	267.7603	271.6700	282.5779	303.1652	326.8473	345.4416 (73)

6. Solar gains												

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
East			4.4700		19.6403		0.6300		0.7000		0.7700	26.8304 (76)
South			1.9200		46.7521		0.6300		0.7000		0.7700	27.4330 (78)
West			8.1800		19.6403		0.6300		0.7000		0.7700	49.0990 (80)

Solar gains	103.3624	193.4622	301.8448	421.4382	504.6206	512.4362	489.4831	427.5669	344.2806	224.7073	127.1925	86.1453 (83)
Total gains	459.7513	548.4761	644.4418	743.5864	805.1397	792.8207	757.2434	699.2370	626.8584	527.8725	454.0398	431.5869 (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	59.5524	59.7275	59.9000	60.7241	60.8808	61.6210	61.6210	61.7601	61.3338	60.8808	60.5646	60.2376
alpha	4.9702	4.9818	4.9933	5.0483	5.0587	5.1081	5.1081	5.1173	5.0889	5.0587	5.0376	5.0158
util living area	0.9988	0.9968	0.9897	0.9615	0.8789	0.7145	0.5446	0.6064	0.8594	0.9817	0.9973	0.9991 (86)
MIT	19.6816	19.8478	20.1264	20.4886	20.7841	20.9474	20.9892	20.9820	20.8602	20.4567	20.0022	19.6575 (87)
Th 2	19.9472	19.9500	19.9527	19.9654	19.9678	19.9789	19.9789	19.9809	19.9746	19.9678	19.9629	19.9579 (88)
util rest of house	0.9983	0.9956	0.9859	0.9466	0.8337	0.6235	0.4248	0.4836	0.7905	0.9722	0.9962	0.9988 (89)
MIT 2	18.7435	18.9115	19.1902	19.5531	19.8224	19.9549	19.9762	19.9758	19.8964	19.5297	19.0763	18.7280 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9426	19.1102	19.3889	19.7516	20.0265	20.1655	20.1911	20.1893	20.1009	19.7264	19.2727	18.9253 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9426	19.1102	19.3889	19.7516	20.0265	20.1655	20.1911	20.1893	20.1009	19.7264	19.2727	18.9253 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9978	0.9944	0.9832	0.9429	0.8367	0.6413	0.4504	0.5098	0.8004	0.9692	0.9951	0.9984 (94)
Ext temp.	458.7199	545.3944	633.5933	701.0905	673.6230	508.4745	341.0967	356.4996	501.7118	511.6373	451.8276	430.8805 (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	1453.4053	1406.3513	1271.9102	1056.3343	808.4437	533.8777	344.4842	362.6782	578.3421	886.1117	1188.0600	1444.9890 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	740.0459	578.5630	474.9077	255.7756	100.3066	0.0000	0.0000	0.0000	0.0000	278.6089	530.0873	754.4967 (98)
Space heating												3712.7918 (98)
Space heating per m2												(98) / (4) = 43.6183 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	901.7123	709.8586	727.4025	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8841	0.9381	0.9154	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	797.1657	665.9136	665.8375	0.0000	0.0000	0.0000	0.0000 (102)
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	162.2897	232.9372	183.8192	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												579.0461 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	40.5724	58.2343	45.9548	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												144.7615 (107)
Space cooling per m2												1.7007 (108)
Energy for space heating												43.6183 (99)
Energy for space cooling												1.7007 (108)
Total												45.3190 (109)
Target Fabric Energy Efficiency (TFEE)												52.1 (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	42.5600 (1b)	x 2.3900 (2b)	= 101.7184 (1b) - (3b)
First floor	42.5600 (1c)	x 2.6700 (2c)	= 113.6352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3536 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1857 (8)
Pressure test					Yes
Measured/design AP50					4.0800
Infiltration rate					0.3897 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3605 (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	0.4236	0.3966	0.3966	0.3605	0.3695	0.3515	0.3515	0.3425	0.3425	0.3695	0.3605	0.3695 (22b)
Effective ac	0.5897	0.5786	0.5786	0.5650	0.5683	0.5618	0.5618	0.5586	0.5586	0.5683	0.5650	0.5683 (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)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5600	0.1200	5.1072	84.0000	3575.0400 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5600		42.5600	0.1000	4.2560	9.1000	387.2960 (30)
Total net area of external elements Aum(A, m ²)			178.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7912		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5600			18.0000	766.0800 (32d)
Internal Ceiling 1			42.5600			18.0000	766.0800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13438.1744 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.8733 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1082 (36)
Total fabric heat loss (33) + (36) = 55.8994 (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	41.9093	41.1214	41.1214	40.1515	40.3853	39.9235	39.9235	39.7013	39.7013	40.3853	40.1515	40.3853 (38)
Heat transfer coeff	97.8087	97.0208	97.0208	96.0509	96.2847	95.8229	95.8229	95.6007	95.6007	96.2847	96.0509	96.2847 (39)
Average = Sum(39)m / 12 =												96.3044 (39)
HLP	1.1491	1.1398	1.1398	1.1284	1.1312	1.1257	1.1257	1.1231	1.1231	1.1312	1.1284	1.1312 (40)
HLP (average)												1.1314 (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												2.5529 (42)
Average daily hot water use (litres/day)												94.8306 (43)
Daily hot water use	104.3137	100.5205	96.7272	92.9340	89.1408	85.3476	85.3476	89.1408	92.9340	96.7272	100.5205	104.3137 (44)
Energy conte	154.6942	135.2965	139.6139	121.7188	116.7921	100.7827	93.3900	107.1663	108.4462	126.3836	137.9576	149.8131 (45)
Energy content (annual)										Total = Sum(45)m =		1492.0550 (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	23.2041	20.2945	20.9421	18.2578	17.5188	15.1174	14.0085	16.0750	16.2669	18.9575	20.6936	22.4720 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5596	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5108	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645 (64)
RHI water heating demand												1815.9160 (64)
Heat gains from water heating, kWh/month	58.3257	51.2087	53.3047	47.1251	45.7033	40.1523	37.9118	42.4991	42.7068	48.9003	52.5350	56.7007 (65)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Total per year (kWh/year) = Sum(64)m =												1815.9160 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7605	46.8614	38.1102	28.8519	21.5671	18.2079	19.6743	25.5733	34.3245	43.5828	50.8676	54.2268	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.9974	346.5566	337.5874	318.4931	294.3900	271.7365	256.6025	253.0433	262.0125	281.1068	305.2099	327.8634	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	(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)	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	(71)
Water heating gains (Table 5)	78.3948	76.2034	71.6462	65.4516	61.4292	55.7671	50.9567	57.1225	59.3149	65.7261	72.9653	76.2106	(72)
Total internal gains	581.0800	576.5488	554.2713	519.7240	484.3138	452.6390	434.1609	442.6666	462.5793	497.3432	535.9702	565.2283	(73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
East			4.4700	25.1733	0.6300	0.7000	0.7700	34.3889 (76)					
South			1.9200	56.5862	0.6300	0.7000	0.7700	33.2035 (78)					
West			8.1800	25.1733	0.6300	0.7000	0.7700	62.9310 (80)					
Solar gains	130.5234	208.0638	330.3037	462.1253	519.9537	583.9623	536.0383	489.0624	394.1183	260.7667	160.1346	102.9433	(83)
Total gains	711.6034	784.6126	884.5750	981.8493	1004.2675	1036.6013	970.1992	931.7290	856.6976	758.1099	696.1047	668.1716	(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	38.1646	38.4745	38.4745	38.8630	38.7686	38.9555	38.9555	39.0460	39.0460	38.7686	38.8630	38.7686	
alpha	3.5443	3.5650	3.5650	3.5909	3.5846	3.5970	3.5970	3.6031	3.6031	3.5846	3.5909	3.5846	
util living area	0.9617	0.9458	0.9021	0.8066	0.6632	0.4542	0.3220	0.3243	0.5762	0.8271	0.9340	0.9670	(86)
MIT	19.7201	19.8867	20.2163	20.6007	20.8520	20.9721	20.9940	20.9941	20.9346	20.6403	20.1532	19.7061	(87)
Th 2	19.9610	19.9685	19.9685	19.9777	19.9755	19.9799	19.9799	19.9820	19.9820	19.9755	19.9777	19.9755	(88)
util rest of house	0.9536	0.9346	0.8821	0.7686	0.6000	0.3700	0.2244	0.2231	0.4880	0.7820	0.9178	0.9598	(89)
MIT 2	18.8303	18.9976	19.3132	19.6738	19.8825	19.9683	19.9786	19.9808	19.9506	19.7166	19.2669	18.8284	(90)
Living area fraction									fLA = Living area / (4) =			0.2122	(91)
MIT	19.0191	19.1863	19.5048	19.8704	20.0882	20.1813	20.1941	20.1958	20.1594	19.9126	19.4550	19.0146	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0191	19.1863	19.5048	19.8704	20.0882	20.1813	20.1941	20.1958	20.1594	19.9126	19.4550	19.0146	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	671.9389	725.1300	770.9259	750.2957	609.9870	401.2827	237.8205	227.9400	431.9256	590.4341	631.8133	635.5818	(94)
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	1312.5050	1279.3421	1155.0168	938.4593	672.8525	410.2439	238.9887	229.0427	455.0019	752.2314	1042.6319	1281.9963	(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	476.5812	372.4306	285.7636	135.4778	46.7719	0.0000	0.0000	0.0000	0.0000	120.3772	295.7894	480.9324	(98)
Space heating												2214.1241	(98)
RHI space heating demand												2214	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5600 (1b)	x 2.3900 (2b)	= 101.7184 (1b) - (3b)
First floor	42.5600 (1c)	x 2.6700 (2c)	= 113.6352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3536 (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) = 0.1857 (8)
Pressure test					Yes
Measured/design AP50					4.0800
Infiltration rate					0.3897 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3605 (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	0.4597	0.4506	0.4416	0.3966	0.3875	0.3425	0.3425	0.3335	0.3605	0.3875	0.4056	0.4236 (22b)
Effective ac	0.6056	0.6015	0.5975	0.5786	0.5751	0.5586	0.5586	0.5556	0.5650	0.5751	0.5822	0.5897 (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)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5600	0.1200	5.1072	84.0000	3575.0400 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5600		42.5600	0.1000	4.2560	9.1000	387.2960 (30)
Total net area of external elements Aum(A, m ²)			178.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7912		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5600			18.0000	766.0800 (32d)
Internal Ceiling 1			42.5600			18.0000	766.0800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13438.1744 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.8733 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1082 (36)
Total fabric heat loss (33) + (36) = 55.8994 (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	43.0408	42.7493	42.4635	41.1214	40.8702	39.7013	39.7013	39.4848	40.1515	40.8702	41.3782	41.9093 (38)
Heat transfer coeff	98.9402	98.6487	98.3629	97.0208	96.7696	95.6007	95.6007	95.3842	96.0509	96.7696	97.2776	97.8087 (39)
Average = Sum(39)m / 12 =												97.0195 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1624	1.1589	1.1556	1.1398	1.1369	1.1231	1.1231	1.1206	1.1284	1.1369	1.1428	1.1491 (40)
HLP (average)												1.1398 (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												2.5529 (42)
Average daily hot water use (litres/day)												94.8306 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.3137	100.5205	96.7272	92.9340	89.1408	85.3476	85.3476	89.1408	92.9340	96.7272	100.5205	104.3137 (44)
Energy conte	154.6942	135.2965	139.6139	121.7188	116.7921	100.7827	93.3900	107.1663	108.4462	126.3836	137.9576	149.8131 (45)
Energy content (annual)										Total = Sum(45)m =		1492.0550 (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	23.2041	20.2945	20.9421	18.2578	17.5188	15.1174	14.0085	16.0750	16.2669	18.9575	20.6936	22.4720 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5596	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5108	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645 (64)
Heat gains from water heating, kWh/month	58.3257	51.2087	53.3047	47.1251	45.7033	40.1523	37.9118	42.4991	42.7068	48.9003	52.5350	56.7007 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1815.9160 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7605	46.8614	38.1102	28.8519	21.5671	18.2079	19.6743	25.5733	34.3245	43.5828	50.8676	54.2268	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.9974	346.5566	337.5874	318.4931	294.3900	271.7365	256.6025	253.0433	262.0125	281.1068	305.2099	327.8634	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	(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)	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	(71)
Water heating gains (Table 5)	78.3948	76.2034	71.6462	65.4516	61.4292	55.7671	50.9567	57.1225	59.3149	65.7261	72.9653	76.2106	(72)
Total internal gains	581.0800	576.5488	554.2713	519.7240	484.3138	452.6390	434.1609	442.6666	462.5793	497.3432	535.9702	565.2283	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				4.4700	19.6403	0.6300	0.7000	0.7700	26.8304 (76)			
South				1.9200	46.7521	0.6300	0.7000	0.7700	27.4330 (78)			
West				8.1800	19.6403	0.6300	0.7000	0.7700	49.0990 (80)			
Solar gains	103.3624	193.4622	301.8448	421.4382	504.6206	512.4362	489.4831	427.5669	344.2806	224.7073	127.1925	86.1453 (83)
Total gains	684.4424	770.0109	856.1161	941.1623	988.9344	965.0752	923.6440	870.2335	806.8599	722.0505	663.1626	651.3736 (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	37.7281	37.8396	37.9495	38.4745	38.5744	39.0460	39.0460	39.1346	38.8630	38.5744	38.3729	38.1646	
alpha	3.5152	3.5226	3.5300	3.5650	3.5716	3.6031	3.6031	3.6090	3.5909	3.5716	3.5582	3.5443	
util living area	0.9731	0.9582	0.9268	0.8581	0.7430	0.5828	0.4404	0.4821	0.6997	0.8895	0.9580	0.9769	(86)
MIT	19.4693	19.6790	20.0162	20.4281	20.7420	20.9225	20.9783	20.9699	20.8463	20.4311	19.8819	19.4321	(87)
Th 2	19.9502	19.9530	19.9557	19.9685	19.9708	19.9820	19.9820	19.9841	19.9777	19.9708	19.9660	19.9610	(88)
util rest of house	0.9675	0.9498	0.9119	0.8293	0.6924	0.5058	0.3448	0.3845	0.6274	0.8605	0.9481	0.9722	(89)
MIT 2	18.5749	18.7824	19.1117	19.5105	19.7902	19.9407	19.9744	19.9727	19.8863	19.5248	18.9945	18.5465	(90)
Living area fraction									fLA = Living area / (4) =			0.2122	(91)
MIT	18.7646	18.9726	19.3036	19.7052	19.9921	20.1490	20.1874	20.1843	20.0900	19.7171	19.1828	18.7344	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7646	18.9726	19.3036	19.7052	19.9921	20.1490	20.1874	20.1843	20.0900	19.7171	19.1828	18.7344	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9595	0.9400	0.9007	0.8210	0.6935	0.5191	0.3647	0.4045	0.6360	0.8520	0.9386	0.9649	(94)
Ext temp.	656.7382	723.7936	771.1424	772.6695	685.8406	500.9495	336.8225	351.9858	513.1679	615.2128	622.4540	628.5151	(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	1431.1346	1388.2476	1259.4020	1048.3295	802.4267	530.4859	342.9599	360.9623	575.3456	882.2592	1175.3841	1421.5908	(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	576.1509	446.5131	363.2651	198.4752	86.7401	0.0000	0.0000	0.0000	0.0000	198.6826	398.1097	590.0483	(98)
Space heating per m2												2857.9849	(98)
										(98) / (4) =		33.5760	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3151.0307 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	576.1509	446.5131	363.2651	198.4752	86.7401	0.0000	0.0000	0.0000	0.0000	198.6826	398.1097	590.0483	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	635.2270	492.2967	400.5128	218.8260	95.6340	0.0000	0.0000	0.0000	0.0000	219.0547	438.9302	650.5494	(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	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645	(64)
Efficiency of water heater (217)m	90.0110	89.9435	89.7986	89.4809	88.9308	87.9000	87.9000	87.9000	87.9000	89.4562	89.8626	87.9000	(216)
Fuel for water heating, kWh/month	202.4795	178.0971	186.1348	165.7709	162.2294	144.8818	137.4612	153.1646	153.6289	172.0332	183.1840	196.9904	(219)
Water heating fuel used												2036.0558	(219)
Annual totals kWh/year													
Space heating fuel - main system												3151.0307	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												372.7064	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 908 * 1.00) =										-530.1869		-530.1869	(233)
Total delivered energy for all uses												5104.6061	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3151.0307	3.4800	109.6559 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2036.0558	3.4800	70.8547 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	372.7064	13.1900	49.1600 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-530.1869	13.1900	-69.9316 (252)
Total energy cost			289.6314 (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] =	0.9349 (257)
SAP value		86.9586
SAP rating (Section 12)		87 (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	3151.0307	0.2160	680.6226 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2036.0558	0.2160	439.7881 (264)
Space and water heating			1120.4107 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.7064	0.5190	193.4346 (268)
Energy saving/generation technologies			
PV Unit	-530.1869	0.5190	-275.1670 (269)
Total kg/year			1077.6033 (272)
CO2 emissions per m2			12.6600 (273)
EI value			88.9026
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8909 = 3.906$, stars = 4
Water heating environmental impact	$0.216 / 0.8909 = 0.2424$, 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	42.5600 (1b)	x 2.3900 (2b)	= 101.7184 (1b) - (3b)
First floor	42.5600 (1c)	x 2.6700 (2c)	= 113.6352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3536 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											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) =	0.1857 (8)
Pressure test											Yes	
Measured/design AP50											4.0800	
Infiltration rate											0.3897 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3605 (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	0.4236	0.3966	0.3966	0.3605	0.3695	0.3515	0.3515	0.3425	0.3425	0.3695	0.3605	0.3695 (22b)
Effective ac	0.5897	0.5786	0.5786	0.5650	0.5683	0.5618	0.5618	0.5586	0.5586	0.5683	0.5650	0.5683 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Front Door			2.1200	1.1000	2.3320			(26)					
Windows (Uw = 1.20)			14.5700	1.1450	16.6832			(27)					
Ground Floor			42.5600	0.1200	5.1072	84.0000	3575.0400	(28a)					
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184	(29a)					
Pitched Roof	42.5600		42.5600	0.1000	4.2560	9.1000	387.2960	(30)					
Total net area of external elements Aum(A, m2)			178.5300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7912			(33)					
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000	(32)					
GF Stud			82.5600			9.0000	743.0400	(32c)					
First Floor			95.3800			9.0000	858.4200	(32c)					
Internal Floor 1			42.5600			18.0000	766.0800	(32d)					
Internal Ceiling 1			42.5600			18.0000	766.0800	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13438.1744	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							157.8733	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1082	(36)					
Total fabric heat loss						(33) + (36) =	55.8994	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 41.9093	Feb 41.1214	Mar 41.1214	Apr 40.1515	May 40.3853	Jun 39.9235	Jul 39.9235	Aug 39.7013	Sep 39.7013	Oct 40.3853	Nov 40.1515	Dec 40.3853	(38)
Heat transfer coeff	97.8087	97.0208	97.0208	96.0509	96.2847	95.8229	95.8229	95.6007	95.6007	96.2847	96.0509	96.2847	(39)
Average = Sum(39)m / 12 =												96.3044	(39)
HLP	Jan 1.1491	Feb 1.1398	Mar 1.1398	Apr 1.1284	May 1.1312	Jun 1.1257	Jul 1.1257	Aug 1.1231	Sep 1.1231	Oct 1.1312	Nov 1.1284	Dec 1.1312	(40)
HLP (average)												1.1314	(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												2.5529 (42)
Average daily hot water use (litres/day)												94.8306 (43)
Daily hot water use	Jan 104.3137	Feb 100.5205	Mar 96.7272	Apr 92.9340	May 89.1408	Jun 85.3476	Jul 85.3476	Aug 89.1408	Sep 92.9340	Oct 96.7272	Nov 100.5205	Dec 104.3137 (44)
Energy conte	154.6942	135.2965	139.6139	121.7188	116.7921	100.7827	93.3900	107.1663	108.4462	126.3836	137.9576	149.8131 (45)
Energy content (annual)										Total = Sum(45)m =		1492.0550 (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	23.2041	20.2945	20.9421	18.2578	17.5188	15.1174	14.0085	16.0750	16.2669	18.9575	20.6936	22.4720 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5596	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5108	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645 (64)
Heat gains from water heating, kWh/month	58.3257	51.2087	53.3047	47.1251	45.7033	40.1523	37.9118	42.4991	42.7068	48.9003	52.5350	56.7007 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1815.9160 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7605	46.8614	38.1102	28.8519	21.5671	18.2079	19.6743	25.5733	34.3245	43.5828	50.8676	54.2268 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.9974	346.5566	337.5874	318.4931	294.3900	271.7365	256.6025	253.0433	262.0125	281.1068	305.2099	327.8634 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701 (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)	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147 (71)
Water heating gains (Table 5)	78.3948	76.2034	71.6462	65.4516	61.4292	55.7671	50.9567	57.1225	59.3149	65.7261	72.9653	76.2106 (72)
Total internal gains	581.0800	576.5488	554.2713	519.7240	484.3138	452.6390	434.1609	442.6666	462.5793	497.3432	535.9702	565.2283 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East				4.4700	25.1733		0.6300	0.7000	0.7700		34.3889 (76)	
South				1.9200	56.5862		0.6300	0.7000	0.7700		33.2035 (78)	
West				8.1800	25.1733		0.6300	0.7000	0.7700		62.9310 (80)	
Solar gains	130.5234	208.0638	330.3037	462.1253	519.9537	583.9623	536.0383	489.0624	394.1183	260.7667	160.1346	102.9433 (83)
Total gains	711.6034	784.6126	884.5750	981.8493	1004.2675	1036.6013	970.1992	931.7290	856.6976	758.1099	696.1047	668.1716 (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	38.1646	38.4745	38.4745	38.8630	38.7686	38.9555	38.9555	39.0460	39.0460	38.7686	38.8630	38.7686
alpha	3.5443	3.5650	3.5650	3.5909	3.5846	3.5970	3.5970	3.6031	3.6031	3.5846	3.5909	3.5846
util living area	0.9617	0.9458	0.9021	0.8066	0.6632	0.4542	0.3220	0.3243	0.5762	0.8271	0.9340	0.9670 (86)
MIT	19.7201	19.8867	20.2163	20.6007	20.8520	20.9721	20.9940	20.9941	20.9346	20.6403	20.1532	19.7061 (87)
Th 2	19.9610	19.9685	19.9685	19.9777	19.9755	19.9799	19.9799	19.9820	19.9820	19.9755	19.9777	19.9755 (88)
util rest of house	0.9536	0.9346	0.8921	0.7686	0.6000	0.3700	0.2244	0.2231	0.4880	0.7820	0.9178	0.9598 (89)
MIT 2	18.8303	18.9976	19.3132	19.6738	19.8825	19.9683	19.9786	19.9808	19.9506	19.7166	19.2669	18.8284 (90)
Living area fraction									fLA = Living area / (4) =			0.2122 (91)
MIT	19.0191	19.1863	19.5048	19.8704	20.0882	20.1813	20.1941	20.1958	20.1594	19.9126	19.4550	19.0146 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0191	19.1863	19.5048	19.8704	20.0882	20.1813	20.1941	20.1958	20.1594	19.9126	19.4550	19.0146 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9443	0.9242	0.8715	0.7642	0.6074	0.3871	0.2451	0.2446	0.5042	0.7788	0.9076	0.9512 (94)
Useful gains	671.9389	725.1300	770.9259	750.2957	609.9870	401.2827	237.8205	227.9400	431.9256	590.4341	631.8133	635.5818 (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	1312.5050	1279.3421	1155.0168	938.4593	672.8525	410.2439	238.9887	229.0427	455.0019	752.2314	1042.6319	1281.9963 (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	476.5812	372.4306	285.7636	135.4778	46.7719	0.0000	0.0000	0.0000	0.0000	120.3772	295.7894	480.9324 (98)
Space heating												2214.1241 (98)
Space heating per m2												(98) / (4) = 26.0118 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2441.1512 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	476.5812	372.4306	285.7636	135.4778	46.7719	0.0000	0.0000	0.0000	0.0000	120.3772	295.7894	480.9324	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	525.4478	410.6180	315.0646	149.3691	51.5677	0.0000	0.0000	0.0000	0.0000	132.7202	326.1184	530.2452	(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	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645	(64)
Efficiency of water heater (217)m	89.9077	89.8393	89.6461	89.2147	88.5694	87.9000	87.9000	87.9000	87.9000	89.1073	89.6786	87.9000	(216)
Fuel for water heating, kWh/month	202.7120	178.3037	186.4513	166.2655	162.8915	144.8818	137.4612	153.1646	153.6289	172.7068	183.5598	197.2291	(219)
Water heating fuel used												2039.2561	(219)
Annual totals kWh/year													
Space heating fuel - main system												2441.1512	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												372.7064	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1030 * 1.00) =										-601.5547		-601.5547	(233)
Total delivered energy for all uses												4326.5590	(238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2441.1512	3.6300	88.6138 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2039.2561	3.6300	74.0250 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	372.7064	19.4400	72.4541 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-601.5547	19.4400	-116.9422 (252)
Total energy cost			227.7307 (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	2441.1512	0.2160	527.2887 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2039.2561	0.2160	440.4793 (264)
Space and water heating			967.7680 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.7064	0.5190	193.4346 (268)
Energy saving/generation technologies			
PV Unit	-601.5547	0.5190	-312.2069 (269)
Total kg/year			887.9207 (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	2441.1512	1.2200	2978.2044 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2039.2561	1.2200	2487.8924 (264)
Space and water heating			5466.0969 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	372.7064	3.0700	1144.2087 (268)
Energy saving/generation technologies			
PV Unit	-601.5547	3.0700	-1846.7729 (269)
Primary energy kWh/year			4993.7827 (272)
Primary energy kWh/m2/year			58.6676 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 87
Current environmental impact rating: B 89

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 27	-190 kg (21.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£27 2.24 kg/m²	B 88	B 91
Total Savings	£27 2.24 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 490 TEST (31 Jan 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	£87	£97	-£10
Mains gas	£258	£221	£36
Space heating	£198	£198	£0
Water heating	£74	£47	£27
Lighting	£72	£72	£0
Generated (PV)	-£117	-£117	£0
Total cost of fuels	£228	£201	£26
Total cost of uses	£227	£200	£27
Delivered energy	51 kWh/m²	40 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	8 kg/m²	2 kg/m²
Primary energy	59 kWh/m²	46 kWh/m²	13 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	42.5600 (1b)	x 2.3900 (2b)	= 101.7184 (1b) - (3b)
First floor	42.5600 (1c)	x 2.6700 (2c)	= 113.6352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3536 (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) = 0.1857 (8)
Pressure test					Yes
Measured/design AP50					4.0800
Infiltration rate					0.3897 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3605 (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	0.4597	0.4506	0.4416	0.3966	0.3875	0.3425	0.3425	0.3335	0.3605	0.3875	0.4056	0.4236 (22b)
Effective ac	0.6056	0.6015	0.5975	0.5786	0.5751	0.5586	0.5586	0.5556	0.5650	0.5751	0.5822	0.5897 (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)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5600	0.1200	5.1072	84.0000	3575.0400 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5600		42.5600	0.1000	4.2560	9.1000	387.2960 (30)
Total net area of external elements Aum(A, m ²)			178.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7912		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5600			18.0000	766.0800 (32d)
Internal Ceiling 1			42.5600			18.0000	766.0800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13438.1744 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.8733 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1082 (36)
Total fabric heat loss (33) + (36) = 55.8994 (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	43.0408	42.7493	42.4635	41.1214	40.8702	39.7013	39.7013	39.4848	40.1515	40.8702	41.3782	41.9093 (38)
Heat transfer coeff	98.9402	98.6487	98.3629	97.0208	96.7696	95.6007	95.6007	95.3842	96.0509	96.7696	97.2776	97.8087 (39)
Average = Sum(39)m / 12 =												97.0195 (39)
HLP	1.1624	1.1589	1.1556	1.1398	1.1369	1.1231	1.1231	1.1206	1.1284	1.1369	1.1428	1.1491 (40)
HLP (average)												1.1398 (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												2.5529 (42)
Average daily hot water use (litres/day)												94.8306 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.3137	100.5205	96.7272	92.9340	89.1408	85.3476	85.3476	89.1408	92.9340	96.7272	100.5205	104.3137 (44)
Energy conte	154.6942	135.2965	139.6139	121.7188	116.7921	100.7827	93.3900	107.1663	108.4462	126.3836	137.9576	149.8131 (45)
Energy content (annual)										Total = Sum(45)m =		1492.0550 (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	23.2041	20.2945	20.9421	18.2578	17.5188	15.1174	14.0085	16.0750	16.2669	18.9575	20.6936	22.4720 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5596	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5108	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645 (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												1.2155 (H8)
Utilisation factor												0.5608 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.8306 (H14)
Volume ratio Veff/V												0.7909 (H15)
Solar storage volume factor												0.9531 (H16)
Solar input												-852.2744 (H17)
Solar input	-24.7143	-41.2410	-70.2381	-94.1329	-116.2933	-114.3349	-112.8239	-98.5748	-77.2038	-52.7211	-29.3147	-20.6816 (63)
Solar input (sum of months) = Sum (63)m =												-852.2744 (63)
Output from w/h	157.5395	118.9458	96.9083	54.2003	27.9787	13.0162	8.0045	36.0569	57.8360	101.1733	135.2993	156.6829 (64)
Total per year (kWh/year) = Sum (64)m =												963.6416 (64)
Heat gains from water heating, kWh/month	58.3257	51.2087	53.3047	47.1251	45.7033	40.1523	37.9118	42.4991	42.7068	48.9003	52.5350	56.7007 (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	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7605	46.8614	38.1102	28.8519	21.5671	18.2079	19.6743	25.5733	34.3245	43.5828	50.8676	54.2268	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.9974	346.5566	337.5874	318.4931	294.3900	271.7365	256.6025	253.0433	262.0125	281.1068	305.2099	327.8634	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	(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)	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	(71)
Water heating gains (Table 5)	78.3948	76.2034	71.6462	65.4516	61.4292	55.7671	50.9567	57.1225	59.3149	65.7261	72.9653	76.2106	(72)
Total internal gains	581.0800	576.5488	554.2713	519.7240	484.3138	452.6390	434.1609	442.6666	462.5793	497.3432	535.9702	565.2283	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East				4.4700	19.6403		0.6300	0.7000	0.7700		26.8304 (76)	
South				1.9200	46.7521		0.6300	0.7000	0.7700		27.4330 (78)	
West				8.1800	19.6403		0.6300	0.7000	0.7700		49.0990 (80)	
Solar gains	103.3624	193.4622	301.8448	421.4382	504.6206	512.4362	489.4831	427.5669	344.2806	224.7073	127.1925	86.1453 (83)
Total gains	684.4424	770.0109	856.1161	941.1623	988.9344	965.0752	923.6440	870.2335	806.8599	722.0505	663.1626	651.3736 (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	37.7281	37.8396	37.9495	38.4745	38.5744	39.0460	39.0460	39.1346	38.8630	38.5744	38.3729	38.1646	
alpha	3.5152	3.5226	3.5300	3.5650	3.5716	3.6031	3.6031	3.6090	3.5909	3.5716	3.5582	3.5443	
util living area	0.9731	0.9582	0.9268	0.8581	0.7430	0.5828	0.4404	0.4821	0.6997	0.8895	0.9580	0.9769 (86)	
MIT	19.4693	19.6790	20.0162	20.4281	20.7420	20.9225	20.9783	20.9699	20.8463	20.4311	19.8819	19.4321 (87)	
Th 2	19.9502	19.9530	19.9557	19.9685	19.9708	19.9820	19.9820	19.9841	19.9777	19.9708	19.9660	19.9610 (88)	
util rest of house	0.9675	0.9498	0.9119	0.8293	0.6924	0.5058	0.3448	0.3845	0.6274	0.8605	0.9481	0.9722 (89)	
MIT 2	18.5749	18.7824	19.1117	19.5105	19.7902	19.9407	19.9744	19.9727	19.8863	19.5248	18.9945	18.5465 (90)	
Living area fraction									fLA = Living area / (4) =			0.2122 (91)	
MIT	18.7646	18.9726	19.3036	19.7052	19.9921	20.1490	20.1874	20.1843	20.0900	19.7171	19.1828	18.7344 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7646	18.9726	19.3036	19.7052	19.9921	20.1490	20.1874	20.1843	20.0900	19.7171	19.1828	18.7344 (93)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9595	0.9400	0.9007	0.8210	0.6935	0.5191	0.3647	0.4045	0.6360	0.8520	0.9386	0.9649	(94)
Useful gains	656.7382	723.7936	771.1424	772.6695	685.8406	500.9495	336.8225	351.9858	513.1679	615.2128	622.4540	628.5151	(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	1431.1346	1388.2476	1259.4020	1048.3295	802.4267	530.4859	342.9599	360.9623	575.3456	882.2592	1175.3841	1421.5908	(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	576.1509	446.5131	363.2651	198.4752	86.7401	0.0000	0.0000	0.0000	0.0000	198.6826	398.1097	590.0483	(98)
Space heating												2857.9849	(98)
Space heating per m2											(98) / (4) =	33.5760	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3151.0307 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	576.1509	446.5131	363.2651	198.4752	86.7401	0.0000	0.0000	0.0000	0.0000	198.6826	398.1097	590.0483	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	635.2270	492.2967	400.5128	218.8260	95.6340	0.0000	0.0000	0.0000	0.0000	219.0547	438.9302	650.5494	(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	157.5395	118.9458	96.9083	54.2003	27.9787	13.0162	8.0045	36.0569	57.8360	101.1733	135.2993	156.6829	(64)
Efficiency of water heater	90.0838	90.0963	90.0956	90.0845	90.0008	87.9000	87.9000	87.9000	87.9000	89.7355	89.9730	90.0978	(216)
(217)m	90.0838	90.0963	90.0956	90.0845	90.0008	87.9000	87.9000	87.9000	87.9000	89.7355	89.9730	90.0978	(217)
Fuel for water heating, kWh/month	174.8810	132.0208	107.5616	60.1661	31.0871	14.8080	9.1064	41.0204	65.7974	112.7461	150.3776	173.9031	(219)
Water heating fuel used												1073.4755	(219)
Annual totals kWh/year													
Space heating fuel - main system												3151.0307	(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)												372.7064	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 908 * 1.00) =										-530.1869		-530.1869	(233)
Total delivered energy for all uses												4192.0258	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3151.0307	3.4800	109.6559	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1073.4755	3.4800	37.3569	(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	372.7064	13.1900	49.1600	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-530.1869	13.1900	-69.9316	(252)
Total energy cost			262.7286	(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] =	0.8480 (257)
SAP value			88.1699
SAP rating (Section 12)			88 (258)
SAP band			B

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	3151.0307	0.2160	680.6226	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1073.4755	0.2160	231.8707	(264)
Space and water heating			912.4934	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	372.7064	0.5190	193.4346	(268)
Energy saving/generation technologies				
PV Unit	-530.1869	0.5190	-275.1670	(269)
Total kg/year			895.6360	(272)
CO2 emissions per m2			10.5200	(273)
EI value			90.7766	
EI rating			91	(274)
EI band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.5600 (1b)	x 2.3900 (2b)	= 101.7184 (1b) - (3b)
First floor	42.5600 (1c)	x 2.6700 (2c)	= 113.6352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 215.3536 (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) = 0.1857 (8)
Pressure test					Yes
Measured/design AP50					4.0800
Infiltration rate					0.3897 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.3605 (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	0.4236	0.3966	0.3966	0.3605	0.3695	0.3515	0.3515	0.3425	0.3425	0.3695	0.3605	0.3695 (22b)
Effective ac	0.5897	0.5786	0.5786	0.5650	0.5683	0.5618	0.5618	0.5586	0.5586	0.5683	0.5650	0.5683 (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)			14.5700	1.1450	16.6832		(27)
Ground Floor			42.5600	0.1200	5.1072	84.0000	3575.0400 (28a)
Brick and Block	93.4100	16.6900	76.7200	0.2400	18.4128	42.2200	3239.1184 (29a)
Pitched Roof	42.5600		42.5600	0.1000	4.2560	9.1000	387.2960 (30)
Total net area of external elements Aum(A, m ²)			178.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7912		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			82.5600			9.0000	743.0400 (32c)
First Floor			95.3800			9.0000	858.4200 (32c)
Internal Floor 1			42.5600			18.0000	766.0800 (32d)
Internal Ceiling 1			42.5600			18.0000	766.0800 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13438.1744 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.8733 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1082 (36)
Total fabric heat loss						(33) + (36) =	55.8994 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.9093	Feb 41.1214	Mar 41.1214	Apr 40.1515	May 40.3853	Jun 39.9235	Jul 39.9235	Aug 39.7013	Sep 39.7013	Oct 40.3853	Nov 40.1515	Dec 40.3853 (38)
Heat transfer coeff	97.8087	97.0208	97.0208	96.0509	96.2847	95.8229	95.8229	95.6007	95.6007	96.2847	96.0509	96.2847 (39)
Average = Sum(39)m / 12 =												96.3044 (39)

HLP	Jan 1.1491	Feb 1.1398	Mar 1.1398	Apr 1.1284	May 1.1312	Jun 1.1257	Jul 1.1257	Aug 1.1231	Sep 1.1231	Oct 1.1312	Nov 1.1284	Dec 1.1312 (40)
HLP (average)												1.1314 (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												2.5529 (42)
Average daily hot water use (litres/day)												94.8306 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.3137	100.5205	96.7272	92.9340	89.1408	85.3476	85.3476	89.1408	92.9340	96.7272	100.5205	104.3137 (44)
Energy conte	154.6942	135.2965	139.6139	121.7188	116.7921	100.7827	93.3900	107.1663	108.4462	126.3836	137.9576	149.8131 (45)
Energy content (annual)										Total = Sum(45)m =		1492.0550 (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	23.2041	20.2945	20.9421	18.2578	17.5188	15.1174	14.0085	16.0750	16.2669	18.9575	20.6936	22.4720 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5596	24.8903	27.5325	26.6145	27.4799	26.5684	27.4384	27.4653	26.5935	27.5108	26.6563	27.5515 (61)
Total heat required for water heating calculated for each month	182.2537	160.1868	167.1464	148.3333	144.2720	127.3511	120.8284	134.6317	135.0398	153.8944	164.6139	177.3645 (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												1.3579 (H8)
Utilisation factor												0.5212 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.8306 (H14)
Volume ratio Veff/V												0.7909 (H15)
Solar storage volume factor												0.9531 (H16)
Solar input												-884.9239 (H17)
Solar input	-28.8762	-41.0652	-71.2587	-95.8550	-111.3899	-121.1599	-114.8781	-104.7577	-81.9936	-56.6710	-34.1540	-22.8646 (63)
Solar input (sum of months) = Sum (63)m =												-884.9239 (63)
Output from w/h	153.3775	119.1216	95.8877	52.4783	32.8821	6.1912	5.9503	29.8740	53.0462	97.2234	130.4599	154.4999 (64)
Total per year (kWh/year) = Sum (64)m =												930.9921 (64)
Heat gains from water heating, kWh/month	58.3257	51.2087	53.3047	47.1251	45.7033	40.1523	37.9118	42.4991	42.7068	48.9003	52.5350	56.7007 (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	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	153.1721	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7605	46.8614	38.1102	28.8519	21.5671	18.2079	19.6743	25.5733	34.3245	43.5828	50.8676	54.2268	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.9974	346.5566	337.5874	318.4931	294.3900	271.7365	256.6025	253.0433	262.0125	281.1068	305.2099	327.8634	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	52.8701	(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)	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	-102.1147	(71)
Water heating gains (Table 5)	78.3948	76.2034	71.6462	65.4516	61.4292	55.7671	50.9567	57.1225	59.3149	65.7261	72.9653	76.2106	(72)
Total internal gains	581.0800	576.5488	554.2713	519.7240	484.3138	452.6390	434.1609	442.6666	462.5793	497.3432	535.9702	565.2283	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East				4.4700	25.1733		0.6300	0.7000	0.7700		34.3889 (76)	
South				1.9200	56.5862		0.6300	0.7000	0.7700		33.2035 (78)	
West				8.1800	25.1733		0.6300	0.7000	0.7700		62.9310 (80)	
Solar gains	130.5234	208.0638	330.3037	462.1253	519.9537	583.9623	536.0383	489.0624	394.1183	260.7667	160.1346	102.9433 (83)
Total gains	711.6034	784.6126	884.5750	981.8493	1004.2675	1036.6013	970.1992	931.7290	856.6976	758.1099	696.1047	668.1716 (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	38.1646	38.4745	38.4745	38.8630	38.7686	38.9555	38.9555	39.0460	39.0460	38.7686	38.8630	38.7686	
alpha	3.5443	3.5650	3.5650	3.5909	3.5846	3.5970	3.5970	3.6031	3.6031	3.5846	3.5909	3.5846	
util living area	0.9617	0.9458	0.9021	0.8066	0.6632	0.4542	0.3220	0.3243	0.5762	0.8271	0.9340	0.9670 (86)	
MIT	19.7201	19.8867	20.2163	20.6007	20.8520	20.9721	20.9940	20.9941	20.9346	20.6403	20.1532	19.7061 (87)	
Th 2	19.9610	19.9685	19.9685	19.9777	19.9755	19.9799	19.9799	19.9820	19.9820	19.9755	19.9777	19.9755 (88)	
util rest of house	0.9536	0.9346	0.8821	0.7686	0.6000	0.3700	0.2244	0.2231	0.4880	0.7820	0.9178	0.9598 (89)	
MIT 2	18.8303	18.9976	19.3132	19.6738	19.8825	19.9683	19.9786	19.9808	19.9506	19.7166	19.2669	18.8284 (90)	
Living area fraction									fLA = Living area / (4) =			0.2122 (91)	
MIT	19.0191	19.1863	19.5048	19.8704	20.0882	20.1813	20.1941	20.1958	20.1594	19.9126	19.4550	19.0146 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.0191	19.1863	19.5048	19.8704	20.0882	20.1813	20.1941	20.1958	20.1594	19.9126	19.4550	19.0146 (93)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9443	0.9242	0.8715	0.7642	0.6074	0.3871	0.2451	0.2446	0.5042	0.7788	0.9076	0.9512	(94)
Useful gains	671.9389	725.1300	770.9259	750.2957	609.9870	401.2827	237.8205	227.9400	431.9256	590.4341	631.8133	635.5818	(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	1312.5050	1279.3421	1155.0168	938.4593	672.8525	410.2439	238.9887	229.0427	455.0019	752.2314	1042.6319	1281.9963	(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	476.5812	372.4306	285.7636	135.4778	46.7719	0.0000	0.0000	0.0000	0.0000	120.3772	295.7894	480.9324	(98)
Space heating												2214.1241	(98)
Space heating per m2											(98) / (4) =	26.0118	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2441.1512	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	476.5812	372.4306	285.7636	135.4778	46.7719	0.0000	0.0000	0.0000	0.0000	120.3772	295.7894	480.9324	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	525.4478	410.6180	315.0646	149.3691	51.5677	0.0000	0.0000	0.0000	0.0000	132.7202	326.1184	530.2452	(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	153.3775	119.1216	95.8877	52.4783	32.8821	6.1912	5.9503	29.8740	53.0462	97.2234	130.4599	154.4999	(64)	
Efficiency of water heater	90.0020	90.0052	89.9799	89.9004	89.5228	87.9000	87.9000	87.9000	87.9000	89.4272	89.8243	90.0029	(217)	
Fuel for water heating, kWh/month	170.4158	132.3497	106.5658	58.3738	36.7304	7.0434	6.7694	33.9863	60.3483	108.7179	145.2391	171.6610	(219)	
Water heating fuel used												1038.2009	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2441.1512	(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)												372.7064	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1030 * 1.00) =										-601.5547		-601.5547	(233)	
Total delivered energy for all uses												3375.5038	(238)	

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2441.1512	3.6300	88.6138	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1038.2009	3.6300	37.6867	(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	372.7064	19.4400	72.4541	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-601.5547	19.4400	-116.9422	(252)
Total energy cost			201.1124	(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	2441.1512	0.2160	527.2887	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1038.2009	0.2160	224.2514	(264)
Space and water heating			751.5400	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	372.7064	0.5190	193.4346	(268)
Energy saving/generation technologies				
PV Unit	-601.5547	0.5190	-312.2069	(269)
Total kg/year			697.6428	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2441.1512	1.2200	2978.2044	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1038.2009	1.2200	1266.6051	(264)
Space and water heating			4244.8095	(265)
Pumps and fans	125.0000	3.0700	383.7500	(267)
Energy for lighting	372.7064	3.0700	1144.2087	(268)
Energy saving/generation technologies				
PV Unit	-601.5547	3.0700	-1846.7729	(269)
Primary energy kWh/year			3925.9953	(272)
Primary energy kWh/m2/year			46.1231	(273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 7	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO+)
Project	7 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.40	TER	18.07
Environmental	89 B	% DER<TER	20.30		
CO ₂ Emissions (t/year)	0.89	DFEE	43.52	TFEE	52.12
General Requirements Compliance	Pass	% DFEE<TFEE	16.50		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

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

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

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 7	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO+)
Project	7 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.40	TER	18.07
Environmental	89 B	% DER<TER	20.30		
CO ₂ Emissions (t/year)	0.89	DFEE	43.52	TFEE	52.12
General Requirements Compliance	Pass	% DFEE<TFEE	16.50		

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

Wall 000001

Wall Type: Standard Wall

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

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

Unheated space: None

Total thickness: 330 mm

U-value: 0.24 W/m² K

Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 7	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO+)
Project	7 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.40	TER	18.07
Environmental	89 B	% DER<TER	20.30		
CO ₂ Emissions (t/year)	0.89	DFEE	43.52	TFEE	52.12
General Requirements Compliance	Pass	% DFEE<TFEE	16.50		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 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 7	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	H (HA/SO+)
Property	7 Oram Way, WEST END, SO30 3JW		
SAP Rating	87 B	DER	14.40
Environmental	89 B	TER	18.07
CO ₂ Emissions (t/year)	0.89	% DER<TER	20.30
General Requirements Compliance	Pass	DfEE	43.52
		TFEE	52.12
		% DfEE<TFEE	16.50
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

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

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	18.46 m	42.56 m ²	2.39 m
1st Storey:	18.46 m	42.56 m ²	2.67 m

7.0 Living Area	18.06	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	157.87	kJ/m²K

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	93.41	76.72

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	44.33

9.2 Internal Walls

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
GF Stud	Plasterboard on timber frame	9.00	82.56
First Floor	Plasterboard on timber frame	9.00	95.38

10.0 External Roofs

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.56	42.56

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	42.56

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	42.56

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.56

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.12	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					3.96	
Front Elevation	Window	[1] Brick and Block	East	None	0.53	Yes				0.51	
Side Elevation	Window	[1] Brick and Block	South	None	0.00					1.92	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					8.18	

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)	1.12	0.098	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	7.20	0.043	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.58	0.060	No	Birtley Supatherm
Independently assessed	E3 Sill	10.39	0.034	No	CD0027
Independently assessed	E4 Jamb	28.50	0.039	No	CD0028
Table K1 - Approved	E5 Ground floor (normal)	18.46	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	18.46	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.70	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.78	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	10.10	0.050	No	CD0035
Table K1 - Approved	E18 Party wall between dwellings	10.10	0.060	No	
Table K1 - Default	P1 Party wall - Ground floor	8.78	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.78	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.78	0.049	No	CD0020

Y-value	0.051	W/m²K
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18.0 Pressure Testing

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

As Built AP₅₀

4.08

m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Windows half open

Cross ventilation possible

Yes

Night Ventilation

Yes

Air change rate

4.00

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings

20

Total number of L.E.L. fittings

20

Percentage of L.E.L. fittings

100.00

%

External

External lights fitted

Yes

Light and motion sensor

Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.73	East	30°	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	£27	B 88	