



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 17, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 10/07/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 8			Issued on Date	10/07/2024
Assessment Reference	As Built	Prop Type Ref	Type A		
Property	17, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	89 B	DER	13.16	TER	18.33
Environmental	89 B	% DER<TER	28.22		
CO ₂ Emissions (t/year)	0.98	DFEE	52.48	TFEE	59.30
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.33	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.16	kgCO ₂ /m ²	Pass
	-5.17 (-28.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.30	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	52.48	kWh/m ² /yr	
	-6.8 (-11.5%)	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	0.13 (max. 0.25)	0.14 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.24 (max. 2.00)	1.80 (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	4.05 (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
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer and at least two room thermostats

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

Continuous extract system

Specific fan power

0.17

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

5.62 m², No overhang

Windows facing East

0.72 m², No overhang

Windows facing South

9.13 m², No overhang

Windows facing West

0.66 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Photovoltaic array	1.20	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 8	Issued on Date	10/07/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Property	17, Shaw Crescent, West End, Southampton, SO30 3LH		

SAP Rating	89 B	DER	13.16	TER	18.33
Environmental	89 B	% DER<TER	28.22		
CO ₂ Emissions (t/year)	0.98	DFEE	52.48	TFEE	59.30
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	0.69	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	0.84	0.06	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	9.98	0.64	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	10.66	0.22	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	34.05	0.54	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	27.75	8.88	
External wall	E20 Exposed floor (normal)	Table K1 - Default	0.320	12.77	4.09	
External wall	E21 Exposed floor (inverted)	Table K1 - Default	0.320	6.00	1.92	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	21.83	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	23.74	1.42	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	10.88	0.48	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	22.31	0.87	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	2.32	-0.21	Knauf P24

Total: **19.15** W/mK:
Y-Value: **0.068** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 8			Issued on Date	10/07/2024
Assessment Reference	As Built	Prop Type Ref	Type A		
Property	17, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	89 B	DER	13.16	TER	18.33
Environmental	89 B	% DER<TER	28.22		
CO ₂ Emissions (t/year)	0.98	DFEE	52.48	TFEE	59.30
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.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

Detached House, total floor area 108 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) 18.33 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.16 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)52.5 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	0.13 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.24 (max. 2.00)	1.80 (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: 4.05 (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
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer and at least two room thermostats 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

Continuous extract system
Specific fan power: 0.17
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:
Average
Windows facing North: 5.62 m², No overhang
Windows facing East: 0.72 m², No overhang
Windows facing South: 9.13 m², No overhang
Windows facing West: 0.66 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 1.20 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	43.8800 (1b)	x 2.6800 (2b)	= 117.5984 (1b) - (3b)
First floor	64.3300 (1c)	x 2.3200 (2c)	= 149.2456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.8440 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												4.0500
Infiltration rate												0.2025 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1721 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2195	0.2152	0.2109	0.1893	0.1850	0.1635	0.1635	0.1592	0.1721	0.1850	0.1936	0.2022 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross 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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			16.1300	1.1450	18.4695		(27)
Personnel Door			1.7600	1.8000	3.1680		(26)
Ground Floor			43.8800	0.1200	5.2656	84.0000	3685.9200 (28a)
Above Garage			20.4500	0.1388	2.8377	20.0000	409.0000 (28a)
Brick and Block	140.3800	18.2800	122.1000	0.2400	29.3040	42.2200	5155.0620 (29a)
Wall to Garage	14.3100	1.7600	12.5500	0.2400	3.0120	42.2200	529.8610 (29a)
Pitched Roof	64.3300		64.3300	0.1000	6.4330	9.1000	585.4030 (30)
Total net area of external elements Aum(A, m ²)			283.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.8547		(33)
Ground Floor Stud			26.3800			9.0000	237.4200 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			151.5500			9.0000	1363.9500 (32c)
Internal Floor 1			43.8800			18.0000	789.8400 (32d)
Internal Ceiling 1			43.8800			18.0000	789.8400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17317.2960 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0342 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1468 (36)
Total fabric heat loss						(33) + (36) =	90.0015 (37)

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

(38)m	Jan 44.0293	Feb 44.0293	Mar 44.0293	Apr 44.0293	May 44.0293	Jun 44.0293	Jul 44.0293	Aug 44.0293	Sep 44.0293	Oct 44.0293	Nov 44.0293	Dec 44.0293 (38)
Heat transfer coeff	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307 (39)
Average = Sum(39)m / 12 =												134.0307 (39)
HLP	Jan 1.2386	Feb 1.2386	Mar 1.2386	Apr 1.2386	May 1.2386	Jun 1.2386	Jul 1.2386	Aug 1.2386	Sep 1.2386	Oct 1.2386	Nov 1.2386	Dec 1.2386 (40)
HLP (average)												1.2386 (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	2.8036 (42)
Average daily hot water use (litres/day)	100.7865 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.8652	106.8337	102.8023	98.7708	94.7393	90.7079	90.7079	94.7393	98.7708	102.8023	106.8337	110.8652	(44)
Energy conte	164.4099	143.7939	148.3825	129.3634	124.1273	107.1124	99.2554	113.8970	115.2573	134.3213	146.6222	159.2222	(45)
Energy content (annual)										Total =	Sum (45)m =	1585.7647	(45)
Distribution loss (46)m = 0.15 x (45)m	24.6615	21.5691	22.2574	19.4045	18.6191	16.0669	14.8883	17.0846	17.2886	20.1482	21.9933	23.8833	(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	0.6697	0.6089	0.6523	0.5750	0.5292	0.4372	0.4051	0.4856	0.5123	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(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	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(64)
Heat gains from water heating, kWh/month	54.8337	47.9637	49.5002	43.1571	41.4046	35.7242	33.1037	37.9921	38.4511	44.8094	48.9071	53.1035	(65)
Total per year (kWh/year) = Sum (64)m = 1592.4999 (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	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3803	22.5426	18.3329	13.8792	10.3748	8.7589	9.4643	12.3020	16.5117	20.9654	24.4698	26.0857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.9587	271.7497	264.7166	249.7439	230.8437	213.0801	201.2129	198.4219	205.4551	220.4277	239.3280	257.0916	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	(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)	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	(71)
Water heating gains (Table 5)	73.7012	71.3746	66.5326	59.9404	55.6514	49.6169	44.4942	51.0647	53.4043	60.2277	67.9265	71.3757	(72)
Total internal gains	436.0950	433.7215	417.6367	391.6181	364.9245	339.5105	323.2260	329.8433	343.4258	369.6755	399.7789	422.6077	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				5.6200	10.6334	0.6300	0.7000	0.7700	18.2633 (74)			
East				0.7200	19.6403	0.6300	0.7000	0.7700	4.3217 (76)			
South				9.1300	46.7521	0.6300	0.7000	0.7700	130.4498 (78)			
West				0.6600	19.6403	0.6300	0.7000	0.7700	3.9615 (80)			
Solar gains	156.9963	264.7490	358.1360	441.7627	496.5426	494.6598	476.1244	434.3690	386.6286	291.2077	187.4858	134.7575 (83)
Total gains	593.0913	698.4705	775.7726	833.3808	861.4672	834.1704	799.3504	764.2124	730.0543	660.8832	587.2648	557.3652 (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	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900
alpha	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927
util living area	0.9919	0.9852	0.9729	0.9463	0.8901	0.7830	0.6442	0.6835	0.8539	0.9566	0.9863	0.9934 (86)
MIT	19.0427	19.2565	19.5899	20.0117	20.4310	20.7573	20.9113	20.8883	20.6424	20.0964	19.4771	18.9858 (87)
Th 2	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892 (88)
util rest of house	0.9900	0.9817	0.9662	0.9315	0.8556	0.7060	0.5161	0.5612	0.7953	0.9417	0.9825	0.9919 (89)
MIT 2	18.1072	18.3195	18.6496	19.0629	19.4616	19.7469	19.8556	19.8432	19.6575	19.1506	18.5403	18.0506 (90)
Living area fraction									fLA = Living area /	(4) =		0.1445 (91)
MIT	18.2424	18.4549	18.7855	19.2000	19.6017	19.8929	20.0082	19.9943	19.7999	19.2873	18.6757	18.1857 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2424	18.4549	18.7855	19.2000	19.6017	19.8929	20.0082	19.9943	19.7999	19.2873	18.6757	18.1857 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9860	0.9756	0.9573	0.9197	0.8447	0.7063	0.5313	0.5743	0.7896	0.9310	0.9767	0.9885	(94)
Useful gains	584.7900	681.4293	742.6311	766.4982	727.6975	589.1367	424.7310	438.8849	576.4150	615.2561	573.5569	550.9396	(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	1868.7085	1816.7752	1646.6319	1380.5222	1059.0669	709.4097	456.8041	481.7436	763.9587	1164.3602	1551.4986	1874.5180	(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	955.2353	762.9524	672.5766	442.0973	246.5388	0.0000	0.0000	0.0000	0.0000	408.5334	704.1180	984.7423	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating
Space heating per m2 (98) / (4) = 5176.7943 (98)
47.8403 (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 %) 90.2000 (206)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating requirement 5739.2398 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	955.2353	762.9524	672.5766	442.0973	246.5388	0.0000	0.0000	0.0000	0.0000	408.5334	704.1180	984.7423 (98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000 (210)
Space heating fuel (main heating system)	1059.0192	845.8453	745.6503	490.1301	273.3246	0.0000	0.0000	0.0000	0.0000	452.9195	780.6186	1091.7321 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708 (64)
Efficiency of water heater (217)m	87.8615	87.6795	87.3384	86.6450	85.0414	76.4000	76.4000	76.4000	76.4000	86.3289	87.4675	76.4000 (216)
Fuel for water heating, kWh/month	187.8861	164.6939	170.6406	149.9665	146.5832	140.7718	130.4457	149.7154	151.5309	156.2765	168.3402	181.7119 (219)
Water heating fuel used												1898.5627 (219)
Annual totals kWh/year												
Space heating fuel - main system												5739.2398 (211)
Space heating fuel - secondary												0.0000 (215)

Electricity for pumps and fans:
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)
mechanical ventilation fans (SFP = 0.2380) 77.4808 (230a)
central heating pump 30.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 152.4808 (231)
Electricity for lighting (calculated in Appendix L) 448.2246 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV Unit 0 (0.80 * 1.20 * 1080 * 1.00) = -1036.3436 -1036.3436 (233)
Total delivered energy for all uses 7202.1643 (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	5739.2398	0.2160	1239.6758 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1898.5627	0.2160	410.0895 (264)
Space and water heating			1649.7653 (265)
Pumps and fans	152.4808	0.5190	79.1375 (267)
Energy for lighting	448.2246	0.5190	232.6286 (268)
Energy saving/generation technologies			
PV Unit	-1036.3436	0.5190	-537.8623 (269)
Total CO2, kg/year			1423.6691 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1600 (273)

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

	TFA N	EF	
DER			13.1600 ZC1
Total Floor Area	108.2100		
Assumed number of occupants	2.8036		
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190		
CO2 emissions from appliances, equation (L14)			14.7287 ZC2
CO2 emissions from cooking, equation (L16)			1.7215 ZC3
Total CO2 emissions			29.6102 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			29.6102 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.8800 (1b)	x 2.6800 (2b)	= 117.5984 (1b) - (3b)
First floor	64.3300 (1c)	x 2.3200 (2c)	= 149.2456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.8440 (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) = 0.1499 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3999 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3399 (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	0.4334	0.4249	0.4164	0.3739	0.3654	0.3229	0.3229	0.3144	0.3399	0.3654	0.3824	0.3994 (22b)
Effective ac	0.5939	0.5903	0.5867	0.5699	0.5668	0.5521	0.5521	0.5494	0.5578	0.5668	0.5731	0.5798 (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			3.9100	1.0000	3.9100		(26)
TER Opening Type (Uw = 1.40)			16.1300	1.3258	21.3845		(27)
Ground Floor			43.8800	0.1300	5.7044		(28a)
Above Garage			20.4500	0.1300	2.6585		(28a)
Brick and Block	140.3800	18.2800	122.1000	0.1800	21.9780		(29a)
Wall to Garage	14.3100	1.7600	12.5500	0.1800	2.2590		(29a)
Pitched Roof	64.3300		64.3300	0.1300	8.3629		(30)
Total net area of external elements Aum(A, m ²)			283.3500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.2573		(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)							17.2642 (36)
Total fabric heat loss						(33) + (36) =	83.5215 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	52.2992	51.9781	51.6633	50.1848	49.9082	48.6205	48.6205	48.3820	49.1165	49.9082	50.4678	51.0528 (38)
Heat transfer coeff	135.8207	135.4996	135.1848	133.7063	133.4297	132.1420	132.1420	131.9035	132.6380	133.4297	133.9893	134.5743 (39)
Average = Sum(39)m / 12 =												133.7050 (39)
HLP	1.2552	1.2522	1.2493	1.2356	1.2331	1.2212	1.2212	1.2190	1.2257	1.2331	1.2382	1.2436 (40)
HLP (average)												1.2356 (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												2.8036 (42)
Average daily hot water use (litres/day)												100.7865 (43)
Daily hot water use	110.8652	106.8337	102.8023	98.7708	94.7393	90.7079	90.7079	94.7393	98.7708	102.8023	106.8337	110.8652 (44)
Energy conte	164.4099	143.7939	148.3825	129.3634	124.1273	107.1124	99.2554	113.8970	115.2573	134.3213	146.6222	159.2222 (45)
Energy content (annual)												1585.7647 (45)
Distribution loss (46)m = 0.15 x (45)m												
24.6615	21.5691	22.2574	19.4045	18.6191	16.0669	14.8883	17.0846	17.2886	20.1482	21.9933	23.8833 (46)	
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	48.7089	48.2781	44.7327	46.2237	48.2781	48.7089	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	215.3688	189.8213	199.3414	178.0723	172.4054	151.8451	145.4791	162.1751	163.9662	185.2802	195.9372	210.1811 (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	215.3688	189.8213	199.3414	178.0723	172.4054	151.8451	145.4791	162.1751	163.9662	185.2802	195.9372	210.1811 (64)
Heat gains from water heating, kWh/month	67.4060	59.3183	62.0769	55.1906	53.3419	46.7980	44.5584	49.9403	50.5003	57.4015	61.0806	65.6811 (65)
Solar input (sum of months) = Sum (63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum (64)m = 2169.8732 (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)
(66)m	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3803	22.5426	18.3329	13.8792	10.3748	8.7589	9.4643	12.3020	16.5117	20.9654	24.4698	26.0857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.9587	271.7497	264.7166	249.7439	230.8437	213.0801	201.2129	198.4219	205.4551	220.4277	239.3280	257.0916	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	(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)	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	(71)
Water heating gains (Table 5)	90.5995	88.2713	83.4367	76.6536	71.6960	64.9973	59.8903	67.1240	70.1393	77.1526	84.8342	88.2811	(72)
Total internal gains	452.9932	450.6183	434.5408	408.3313	380.9692	354.8909	338.6221	345.9027	360.1607	386.6004	416.6866	439.5130	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				5.6200	10.6334		0.6300		0.7000		0.7700		18.2633 (74)
East				0.7200	19.6403		0.6300		0.7000		0.7700		4.3217 (76)
South				9.1300	46.7521		0.6300		0.7000		0.7700		130.4498 (78)
West				0.6600	19.6403		0.6300		0.7000		0.7700		3.9615 (80)

Solar gains	156.9963	264.7490	358.1360	441.7627	496.5426	494.6598	476.1244	434.3690	386.6286	291.2077	187.4858	134.7575	(83)
Total gains	609.9895	715.3673	792.6767	850.0940	877.5118	849.5507	814.7465	780.2717	746.7893	677.8081	604.1725	574.2706	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.3272	55.4584	55.5875	56.2022	56.3187	56.8675	56.8675	56.9703	56.6548	56.3187	56.0835	55.8397	
alpha	4.6885	4.6972	4.7058	4.7468	4.7546	4.7912	4.7912	4.7980	4.7770	4.7546	4.7389	4.7226	
util living area	0.9985	0.9964	0.9915	0.9771	0.9347	0.8254	0.6663	0.7102	0.8992	0.9828	0.9967	0.9988	(86)
MIT	19.5871	19.7486	19.9990	20.3272	20.6403	20.8762	20.9670	20.9549	20.7914	20.3831	19.9235	19.5602	(87)
Th 2	19.8761	19.8785	19.8808	19.8916	19.8936	19.9031	19.9031	19.9049	19.8995	19.8936	19.8895	19.8852	(88)
util rest of house	0.9979	0.9952	0.9883	0.9672	0.9033	0.7394	0.5229	0.5719	0.8389	0.9735	0.9954	0.9984	(89)
MIT 2	17.9967	18.2341	18.6004	19.0813	19.5172	19.8120	19.8900	19.8847	19.7205	19.1671	18.4980	17.9636	(90)
Living area fraction	18.2265	18.4530	18.8025	19.2614	19.6796	19.9658	20.0456	20.0394	19.8753	19.3429	18.7040	18.1944	(91)
MIT	18.2265	18.4530	18.8025	19.2614	19.6796	19.9658	20.0456	20.0394	19.8753	19.3429	18.7040	18.1944	(92)
Temperature adjustment	18.2265	18.4530	18.8025	19.2614	19.6796	19.9658	20.0456	20.0394	19.8753	19.3429	18.7040	18.1944	(93)
adjusted MIT	18.2265	18.4530	18.8025	19.2614	19.6796	19.9658	20.0456	20.0394	19.8753	19.3429	18.7040	18.1944	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9927	0.9838	0.9595	0.8956	0.7452	0.5431	0.5907	0.8372	0.9668	0.9930	0.9974	(94)
Useful gains	607.9355	710.1318	779.7993	815.6798	785.8696	633.0594	442.5099	460.9454	625.2419	655.3339	599.9650	572.8060	(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	1891.5107	1836.4230	1663.1164	1385.3792	1064.7098	709.0509	455.3131	480.0471	766.0189	1166.5580	1554.8142	1883.2870	(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	954.9799	756.8677	657.1879	410.1836	207.4571	0.0000	0.0000	0.0000	0.0000	380.3507	687.4914	974.9978	(98)
Space heating												5029.5162	(98)
Space heating per m2												46.4792	(99)
(98) / (4) =													

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													5384.9209 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	954.9799	756.8677	657.1879	410.1836	207.4571	0.0000	0.0000	0.0000	0.0000	380.3507	687.4914	974.9978	(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)	1022.4625	810.3509	703.6273	439.1687	222.1168	0.0000	0.0000	0.0000	0.0000	407.2277	736.0722	1043.8949	(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	215.3688	189.8213	199.3414	178.0723	172.4054	151.8451	145.4791	162.1751	163.9662	185.2802	195.9372	210.1811	(64)
Efficiency of water heater (217)m	88.3549	88.1762	87.8290	87.0843	85.5181	80.3000	80.3000	80.3000	80.3000	86.8229	87.9466	88.4276	(216)
Fuel for water heating, kWh/month	243.7541	215.2750	226.9653	204.4827	201.6011	189.0972	181.1695	201.9616	204.1920	213.4002	222.7912	237.6873	(219)
Water heating fuel used												2542.3771	(219)
Annual totals kWh/year													
Space heating fuel - main system												5384.9209	(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)												448.2246	(232)
Total delivered energy for all uses												8450.5227	(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	5384.9209	0.2160	1163.1429 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2542.3771	0.2160	549.1535 (264)
Space and water heating			1712.2964 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	448.2246	0.5190	232.6286 (268)
Total CO2, kg/m2/year			1983.8500 (272)
Emissions per m2 for space and water heating			15.8238 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1498 (272b)
Emissions per m2 for pumps and fans			0.3597 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8238 * 1.00) + 2.1498 + 0.3597, rounded to 2 d.p.			18.3300 (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	43.8800 (1b)	x 2.6800 (2b)	= 117.5984 (1b) - (3b)
First floor	64.3300 (1c)	x 2.3200 (2c)	= 149.2456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.8440 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000	/ (5) =	0.1499 (8)	
Pressure test										Yes							
Measured/design AP50										4.0500							
Infiltration rate										0.3524 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =				0.8500 (20)			
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =				0.2995 (21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
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	(22)				
Adj infilt rate	0.3819	0.3744	0.3669	0.3295	0.3220	0.2846	0.2846	0.2771	0.2995	0.3220	0.3370	0.3520	(22b)				
Effective ac	0.5729	0.5701	0.5673	0.5543	0.5518	0.5405	0.5405	0.5384	0.5449	0.5518	0.5568	0.5619	(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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			16.1300	1.1450	18.4695		(27)
Personnel Door			1.7600	1.8000	3.1680		(26)
Ground Floor			43.8800	0.1200	5.2656	84.0000	3685.9200 (28a)
Above Garage			20.4500	0.1388	2.8377	20.0000	409.0000 (28a)
Brick and Block	140.3800	18.2800	122.1000	0.2400	29.3040	42.2200	5155.0620 (29a)
Wall to Garage	14.3100	1.7600	12.5500	0.2400	3.0120	42.2200	529.8610 (29a)
Pitched Roof	64.3300		64.3300	0.1000	6.4330	9.1000	585.4030 (30)
Total net area of external elements Aum(A, m ²)			283.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.8547		(33)
Ground Floor Stud			26.3800			9.0000	237.4200 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			151.5500			9.0000	1363.9500 (32c)
Internal Floor 1			43.8800			18.0000	789.8400 (32d)
Internal Ceiling 1			43.8800			9.0000	394.9200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16922.3760 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.3846 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1468 (36)
Total fabric heat loss						(33) + (36) =	90.0015 (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	50.4513	50.2019	49.9575	48.8094	48.5946	47.5946	47.5946	47.4094	47.9798	48.5946	49.0291	49.4834 (38)
Heat transfer coeff	140.4528	140.2034	139.9589	138.8108	138.5960	137.5961	137.5961	137.4109	137.9812	138.5960	139.0306	139.4849 (39)
Average = Sum(39)m / 12 =												138.8098 (39)
HLP	1.2980	1.2957	1.2934	1.2828	1.2808	1.2716	1.2716	1.2699	1.2751	1.2808	1.2848	1.2890 (40)
HLP (average)												1.2828 (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 2.8036 (42)
Average daily hot water use (litres/day) 100.7865 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

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Energy conte	110.8652	106.8337	102.8023	98.7708	94.7393	90.7079	90.7079	94.7393	98.7708	102.8023	106.8337	110.8652 (44)
Energy content (annual)	164.4099	143.7939	148.3825	129.3634	124.1273	107.1124	99.2554	113.8970	115.2573	134.3213	146.6222	159.2222 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1585.7647 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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	34.9371	30.5562	31.5313	27.4897	26.3770	22.7614	21.0918	24.2031	24.4922	28.5433	31.1572	33.8347 (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	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3803	22.5426	18.3329	13.8792	10.3748	8.7589	9.4643	12.3020	16.5117	20.9654	24.4698	26.0857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.9587	271.7497	264.7166	249.7439	230.8437	213.0801	201.2129	198.4219	205.4551	220.4277	239.3280	257.0916	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	(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)	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	(71)
Water heating gains (Table 5)	46.9585	45.4706	42.3807	38.1802	35.4530	31.6130	28.3492	32.5311	34.0169	38.3646	43.2739	45.4768	(72)
Total internal gains	406.3522	404.8175	390.4848	366.8579	341.7262	318.5066	304.0810	308.3097	321.0384	344.8124	372.1263	393.7087	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.6200	10.6334	0.6300	0.7000		18.2633	(74)
East	0.7200	19.6403	0.6300	0.7000		4.3217	(76)
South	9.1300	46.7521	0.6300	0.7000		130.4498	(78)
West	0.6600	19.6403	0.6300	0.7000		3.9615	(80)

Solar gains	156.9963	264.7490	358.1360	441.7627	496.5426	494.6598	476.1244	434.3690	386.6286	291.2077	187.4858	134.7575	(83)
Total gains	563.3485	669.5665	748.6208	808.6206	838.2688	813.1665	780.2054	742.6787	707.6669	636.0201	559.6121	528.4663	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.4679	33.5274	33.5860	33.8638	33.9163	34.1628	34.1628	34.2088	34.0674	33.9163	33.8103	33.7001	
alpha	3.2312	3.2352	3.2391	3.2576	3.2611	3.2775	3.2775	3.2806	3.2712	3.2611	3.2540	3.2467	
util living area	0.9924	0.9861	0.9747	0.9498	0.8977	0.7958	0.6616	0.7013	0.8646	0.9600	0.9873	0.9938	(86)
MIT	18.8787	19.1026	19.4549	19.9135	20.3603	20.7209	20.8934	20.8670	20.5937	20.0092	19.3560	18.8363	(87)
Th 2	19.8424	19.8442	19.8460	19.8543	19.8559	19.8632	19.8632	19.8645	19.8604	19.8559	19.8527	19.8494	(88)
util rest of house	0.9906	0.9829	0.9683	0.9358	0.8647	0.7200	0.5314	0.5781	0.8082	0.9461	0.9838	0.9924	(89)
MIT 2	17.9130	18.1368	18.4873	18.9439	19.3723	19.6974	19.8221	19.8087	19.5942	19.0437	18.3964	17.8758	(90)
Living area fraction									fLA = Living area / (4) =				0.1445 (91)
MIT	18.0526	18.2764	18.6271	19.0840	19.5151	19.8453	19.9769	19.9616	19.7387	19.1833	18.5351	18.0147	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0526	18.2764	18.6271	19.0840	19.5151	19.8453	19.9769	19.9616	19.7387	19.1833	18.5351	18.0147	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9867	0.9767	0.9593	0.9235	0.8525	0.7186	0.5461	0.5902	0.8008	0.9351	0.9781	0.9891	(94)
Ext temp.	555.8623	653.9902	718.1507	746.7974	714.6167	584.3792	426.0672	438.3597	566.6902	594.7449	547.3369	522.6927	(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	1931.5888	1875.4153	1697.3019	1413.6504	1083.1384	721.7389	464.6477	489.4092	778.0334	1189.6062	1589.8293	1926.9357	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	1023.5405	820.7976	728.4884	480.1341	274.1801	0.0000	0.0000	0.0000	0.0000	442.5768	750.5945	1044.7568	(98)
												5565.0689	(98)
												51.4284	(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	
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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	1293.4029	1018.2108	1044.3226	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6853	0.7667	0.7406	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	886.3700	780.6797	773.4073	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1060.4124	1019.5350	977.8407	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	125.3105	177.7083	152.0985	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction									FC = cooled area / (4) =			455.1173	(104)
Intermittency factor (Table 10b)												1.0000	(105)
	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	31.3276	44.4271	38.0246	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													
Space cooling per m2												113.7793	(107)
Energy for space heating												1.0515	(108)
Energy for space cooling												51.4284	(99)
Total												1.0515	(108)
Dwelling Fabric Energy Efficiency (DFEE)												52.4799	(109)
												52.5	(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	43.8800 (1b)	x 2.6800 (2b)	= 117.5984 (1b) - (3b)
First floor	64.3300 (1c)	x 2.3200 (2c)	= 149.2456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.8440 (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) = 0.1499 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3999 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3399 (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	0.4334	0.4249	0.4164	0.3739	0.3654	0.3229	0.3229	0.3144	0.3399	0.3654	0.3824	0.3994 (22b)
Effective ac	0.5939	0.5903	0.5867	0.5699	0.5668	0.5521	0.5521	0.5494	0.5578	0.5668	0.5731	0.5798 (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			3.9100	1.0000	3.9100		(26)
TER Opening Type (Uw = 1.40)			16.1300	1.3258	21.3845		(27)
Ground Floor			43.8800	0.1300	5.7044		(28a)
Above Garage			20.4500	0.1300	2.6585		(28a)
Brick and Block	140.3800	18.2800	122.1000	0.1800	21.9780		(29a)
Wall to Garage	14.3100	1.7600	12.5500	0.1800	2.2590		(29a)
Pitched Roof	64.3300		64.3300	0.1300	8.3629		(30)
Total net area of external elements Aum(A, m ²)			283.3500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.2573		(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)							17.2642 (36)
Total fabric heat loss						(33) + (36) =	83.5215 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	52.2992	51.9781	51.6633	50.1848	49.9082	48.6205	48.6205	48.3820	49.1165	49.9082	50.4678	51.0528 (38)
Heat transfer coeff	135.8207	135.4996	135.1848	133.7063	133.4297	132.1420	132.1420	131.9035	132.6380	133.4297	133.9893	134.5743 (39)
Average = Sum(39)m / 12 =												133.7050 (39)
HLP	1.2552	1.2522	1.2493	1.2356	1.2331	1.2212	1.2212	1.2190	1.2257	1.2331	1.2382	1.2436 (40)
HLP (average)												1.2356 (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												2.8036 (42)
Average daily hot water use (litres/day)												100.7865 (43)
Daily hot water use	110.8652	106.8337	102.8023	98.7708	94.7393	90.7079	90.7079	94.7393	98.7708	102.8023	106.8337	110.8652 (44)
Energy conte	164.4099	143.7939	148.3825	129.3634	124.1273	107.1124	99.2554	113.8970	115.2573	134.3213	146.6222	159.2222 (45)
Energy content (annual)										Total = Sum(45)m =		1585.7647 (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												

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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)
	34.9371	30.5562	31.5313	27.4897	26.3770	22.7614	21.0918	24.2031	24.4922	28.5433	31.1572	33.8347 (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	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	140.1822	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3803	22.5426	18.3329	13.8792	10.3748	8.7589	9.4643	12.3020	16.5117	20.9654	24.4698	26.0857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.9587	271.7497	264.7166	249.7439	230.8437	213.0801	201.2129	198.4219	205.4551	220.4277	239.3280	257.0916	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	37.0182	(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)	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	(71)
Water heating gains (Table 5)	46.9585	45.4706	42.3807	38.1802	35.4530	31.6130	28.3492	32.5311	34.0169	38.3646	43.2739	45.4768	(72)
Total internal gains	406.3522	404.8175	390.4848	366.8579	341.7262	318.5066	304.0810	308.3097	321.0384	344.8124	372.1263	393.7087	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.6200	10.6334	0.6300	0.7000	0.7700	18.2633	(74)
East	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217	(76)
South	9.1300	46.7521	0.6300	0.7000	0.7700	130.4498	(78)
West	0.6600	19.6403	0.6300	0.7000	0.7700	3.9615	(80)

Solar gains	156.9963	264.7490	358.1360	441.7627	496.5426	494.6598	476.1244	434.3690	386.6286	291.2077	187.4858	134.7575	(83)
Total gains	563.3485	669.5665	748.6208	808.6206	838.2688	813.1665	780.2054	742.6787	707.6669	636.0201	559.6121	528.4663	(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	55.3272	55.4584	55.5875	56.2022	56.3187	56.8675	56.8675	56.9703	56.6548	56.3187	56.0835	55.8397	
alpha	4.6885	4.6972	4.7058	4.7468	4.7546	4.7912	4.7912	4.7980	4.7770	4.7546	4.7389	4.7226	
util living area	0.9989	0.9973	0.9933	0.9811	0.9439	0.8431	0.6885	0.7349	0.9142	0.9866	0.9977	0.9992	(86)
MIT	19.5476	19.7102	19.9629	20.2954	20.6155	20.8628	20.9621	20.9477	20.7703	20.3501	19.8860	19.5213	(87)
Th 2	19.8761	19.8785	19.8808	19.8916	19.8936	19.9031	19.9031	19.9049	19.8995	19.8936	19.8895	19.8852	(88)
util rest of house	0.9985	0.9963	0.9907	0.9727	0.9157	0.7606	0.5436	0.5967	0.8595	0.9792	0.9966	0.9989	(89)
MIT 2	18.5536	18.7176	18.9710	19.3079	19.6152	19.8326	19.8925	19.8884	19.7616	19.3659	18.9022	18.5344	(90)
Living area fraction									fLA = Living area / (4) =			0.1445	(91)
MIT	18.6972	18.8611	19.1144	19.4506	19.7598	19.9815	20.0471	20.0415	19.9074	19.5081	19.0444	18.6771	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6972	18.8611	19.1144	19.4506	19.7598	19.9815	20.0471	20.0415	19.9074	19.5081	19.0444	18.6771	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	562.1747	666.2667	739.8160	782.9854	764.0166	624.2013	440.4549	457.5419	608.5897	620.4715	557.1032	527.6537	(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	1955.4426	1891.7164	1705.2689	1410.6811	1075.4183	711.1275	455.5107	480.3303	770.2851	1188.6107	1600.4173	1948.2432	(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	1036.5913	823.5022	718.2969	451.9409	231.6829	0.0000	0.0000	0.0000	0.0000	422.6955	751.1862	1056.9186	(98)
Space heating												5492.8145	(98)
Space heating per m2										(98) / (4) =		50.7607	(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	1242.1345	977.8506	1002.4666	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7561	0.8441	0.8171	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	939.2073	825.4278	819.0922	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1060.4124	1019.5350	977.8407	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	87.2677	144.4157	118.1089	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												349.7923 (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	21.8169	36.1039	29.5272	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												87.4481 (107)
Space cooling per m2												0.8081 (108)
Energy for space heating												50.7607 (99)
Energy for space cooling												0.8081 (108)
Total												51.5688 (109)
Target Fabric Energy Efficiency (TFEE)												59.3 (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	43.8800 (1b)	x 2.6800 (2b)	= 117.5984 (1b) - (3b)
First floor	64.3300 (1c)	x 2.3200 (2c)	= 149.2456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.8440 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour			
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											Air changes per hour		
Pressure test											0.0000 / (5) =		0.0000 (8)
Measured/design AP50											Yes		
Infiltration rate											4.0500		
Number of sides sheltered											0.2025 (18)		
											2 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.1721 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)	
Adj infilt rate	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)	
	0.2022	0.1893	0.1893	0.1721	0.1764	0.1678	0.1678	0.1635	0.1635	0.1764	0.1721	0.1764 (22b)	
Mechanical extract ventilation - centralised													
If mechanical ventilation:													0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)	

3. Heat losses and heat loss parameter

Element	Gross 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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			16.1300	1.1450	18.4695		(27)
Personnel Door			1.7600	1.8000	3.1680		(26)
Ground Floor			43.8800	0.1200	5.2656	84.0000	3685.9200 (28a)
Above Garage			20.4500	0.1388	2.8377	20.0000	409.0000 (28a)
Brick and Block	140.3800	18.2800	122.1000	0.2400	29.3040	42.2200	5155.0620 (29a)
Wall to Garage	14.3100	1.7600	12.5500	0.2400	3.0120	42.2200	529.8610 (29a)
Pitched Roof	64.3300		64.3300	0.1000	6.4330	9.1000	585.4030 (30)
Total net area of external elements Aum(A, m ²)			283.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.8547		(33)
Ground Floor Stud			26.3800			9.0000	237.4200 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			151.5500			9.0000	1363.9500 (32c)
Internal Floor 1			43.8800			18.0000	789.8400 (32d)
Internal Ceiling 1			43.8800			18.0000	789.8400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17317.2960 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0342 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1468 (36)
Total fabric heat loss						(33) + (36) =	90.0015 (37)

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

(38)m	Jan 44.0293	Feb 44.0293	Mar 44.0293	Apr 44.0293	May 44.0293	Jun 44.0293	Jul 44.0293	Aug 44.0293	Sep 44.0293	Oct 44.0293	Nov 44.0293	Dec 44.0293 (38)
Heat transfer coeff	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307 (39)
Average = Sum(39)m / 12 =												134.0307 (39)
HLP	Jan 1.2386	Feb 1.2386	Mar 1.2386	Apr 1.2386	May 1.2386	Jun 1.2386	Jul 1.2386	Aug 1.2386	Sep 1.2386	Oct 1.2386	Nov 1.2386	Dec 1.2386 (40)
HLP (average)												1.2386 (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	2.8036 (42)
Average daily hot water use (litres/day)	100.7865 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.8652	106.8337	102.8023	98.7708	94.7393	90.7079	90.7079	94.7393	98.7708	102.8023	106.8337	110.8652	(44)
Energy conte	164.4099	143.7939	148.3825	129.3634	124.1273	107.1124	99.2554	113.8970	115.2573	134.3213	146.6222	159.2222	(45)
Energy content (annual)	Total = Sum (45)m = 1585.7647 (45)												
Distribution loss (46)m = 0.15 x (45)m	24.6615	21.5691	22.2574	19.4045	18.6191	16.0669	14.8883	17.0846	17.2886	20.1482	21.9933	23.8833	(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	0.6697	0.6089	0.6523	0.5750	0.5292	0.4372	0.4051	0.4856	0.5123	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month													
Solar input	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =	0.0000 (63)												
Output from w/h	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(64)
	Total per year (kWh/year) = Sum (64)m = 1592.4999 (64)												
RHI water heating demand	1592 (64)												
Heat gains from water heating, kWh/month	54.8337	47.9637	49.5002	43.1571	41.4046	35.7242	33.1037	37.9921	38.4511	44.8094	48.9071	53.1035	(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	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.4508	56.3565	45.8322	34.6979	25.9371	21.8972	23.6607	30.7550	41.2793	52.4136	61.1744	65.2143	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	401.4310	405.5966	395.0994	372.7522	344.5428	318.0300	300.3178	296.1522	306.6493	328.9966	357.2059	383.7188	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	(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)	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	(71)
Water heating gains (Table 5)	73.7012	71.3746	66.5326	59.9404	55.6514	49.6169	44.4942	51.0647	53.4043	60.2277	67.9265	71.3757	(72)
Total internal gains	652.2814	647.0260	621.1625	581.0888	539.8296	503.2424	482.1710	491.6703	515.0314	555.3363	600.0053	634.0072	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					5.6200	13.4684	0.6300	0.7000			0.7700			23.1326 (74)
East					0.7200	25.1733	0.6300	0.7000			0.7700			5.5392 (76)
South					9.1300	56.5862	0.6300	0.7000			0.7700			157.8895 (78)
West					0.6600	25.1733	0.6300	0.7000			0.7700			5.0776 (80)

Solar gains	191.6388	275.0437	379.9037	474.0918	505.3263	558.9589	516.1535	488.1965	430.4510	326.6480	228.0736	155.7538	(83)	
Total gains	843.9202	922.0697	1001.0662	1055.1806	1045.1559	1062.2014	998.3245	979.8668	945.4824	881.9843	828.0789	789.7609	(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	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	
alpha	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	
util living area	0.9710	0.9602	0.9340	0.8789	0.7773	0.5834	0.4270	0.4224	0.6765	0.8726	0.9505	0.9755	(86)
MIT	19.5236	19.6654	19.9787	20.3671	20.7077	20.9243	20.9810	20.9822	20.8684	20.4979	19.9622	19.4813	(87)
Th 2	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	(88)
util rest of house	0.9643	0.9512	0.9184	0.8482	0.7162	0.4778	0.2906	0.2828	0.5785	0.8326	0.9370	0.9697	(89)
MIT 2	18.5828	18.7214	19.0260	19.3946	19.6978	19.8570	19.8854	19.8858	19.8243	19.5219	19.0147	18.5417	(90)
Living area fraction	fLA = Living area / (4) = 0.1445 (91)												
MIT	18.7187	18.8579	19.1637	19.5351	19.8437	20.0112	20.0437	20.0443	19.9752	19.6630	19.1517	18.6775	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.7187	18.8579	19.1637	19.5351	19.8437	20.0112	20.0437	20.0443	19.9752	19.6630	19.1517	18.6775	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9551	0.9405	0.9058	0.8367	0.7134	0.4902	0.3104	0.3031	0.5869	0.8228	0.9255	0.9613	(94)
Useful gains	806.0410	867.1828	906.7946	882.8222	745.5903	520.7247	309.8436	296.9896	554.9130	725.7348	766.3615	759.2077	(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	1758.3141	1723.3481	1549.8887	1264.5969	903.8683	551.0312	314.1297	300.8040	613.2185	1013.6759	1414.2469	1739.3885	(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													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

	708.4912	575.3431	478.4620	274.8778	117.7588	0.0000	0.0000	0.0000	0.0000	214.2282	466.4775	729.2545 (98)
Space heating												3564.8932 (98)
RHI space heating demand												3565 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.8800 (1b)	x 2.6800 (2b)	= 117.5984 (1b) - (3b)
First floor	64.3300 (1c)	x 2.3200 (2c)	= 149.2456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.8440 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																0 * 10 =	0.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) =	0.0000 (8)	
Pressure test															Yes		
Measured/design AP50															4.0500		
Infiltration rate															0.2025 (18)		
Number of sides sheltered															2 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.1721 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)					
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)					
Adj infilt rate																	
	0.2195	0.2152	0.2109	0.1893	0.1850	0.1635	0.1635	0.1592	0.1721	0.1850	0.1936	0.2022 (22b)					
Mechanical extract ventilation - centralised																	
If mechanical ventilation:															0.5000 (23a)		
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)					

3. Heat losses and heat loss parameter

Element	Gross 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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			16.1300	1.1450	18.4695		(27)
Personnel Door			1.7600	1.8000	3.1680		(26)
Ground Floor			43.8800	0.1200	5.2656	84.0000	3685.9200 (28a)
Above Garage			20.4500	0.1388	2.8377	20.0000	409.0000 (28a)
Brick and Block	140.3800	18.2800	122.1000	0.2400	29.3040	42.2200	5155.0620 (29a)
Wall to Garage	14.3100	1.7600	12.5500	0.2400	3.0120	42.2200	529.8610 (29a)
Pitched Roof	64.3300		64.3300	0.1000	6.4330	9.1000	585.4030 (30)
Total net area of external elements Aum(A, m ²)			283.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.8547		(33)
Ground Floor Stud			26.3800			9.0000	237.4200 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			151.5500			9.0000	1363.9500 (32c)
Internal Floor 1			43.8800			18.0000	789.8400 (32d)
Internal Ceiling 1			43.8800			18.0000	789.8400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17317.2960 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0342 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1468 (36)
Total fabric heat loss						(33) + (36) =	90.0015 (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	44.0293	44.0293	44.0293	44.0293	44.0293	44.0293	44.0293	44.0293	44.0293	44.0293	44.0293	44.0293 (38)
Heat transfer coeff	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307 (39)
Average = Sum(39)m / 12 =												134.0307 (39)
HLP	Jan 1.2386	Feb 1.2386	Mar 1.2386	Apr 1.2386	May 1.2386	Jun 1.2386	Jul 1.2386	Aug 1.2386	Sep 1.2386	Oct 1.2386	Nov 1.2386	Dec 1.2386 (40)
HLP (average)												1.2386 (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	2.8036 (42)
Average daily hot water use (litres/day)	100.7865 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.8652	106.8337	102.8023	98.7708	94.7393	90.7079	90.7079	94.7393	98.7708	102.8023	106.8337	110.8652	(44)
Energy conte	164.4099	143.7939	148.3825	129.3634	124.1273	107.1124	99.2554	113.8970	115.2573	134.3213	146.6222	159.2222	(45)
Energy content (annual)	Total = Sum (45)m =												1585.7647 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6615	21.5691	22.2574	19.4045	18.6191	16.0669	14.8883	17.0846	17.2886	20.1482	21.9933	23.8833	(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	0.6697	0.6089	0.6523	0.5750	0.5292	0.4372	0.4051	0.4856	0.5123	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(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	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(64)
Heat gains from water heating, kWh/month	54.8337	47.9637	49.5002	43.1571	41.4046	35.7242	33.1037	37.9921	38.4511	44.8094	48.9071	53.1035	(65)
Total per year (kWh/year) = Sum (64)m =												1592.4999	(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	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.4508	56.3565	45.8322	34.6979	25.9371	21.8972	23.6607	30.7550	41.2793	52.4136	61.1744	65.2143	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	401.4310	405.5966	395.0994	372.7522	344.5428	318.0300	300.3178	296.1522	306.6493	328.9966	357.2059	383.7188	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	(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)	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	(71)
Water heating gains (Table 5)	73.7012	71.3746	66.5326	59.9404	55.6514	49.6169	44.4942	51.0647	53.4043	60.2277	67.9265	71.3757	(72)
Total internal gains	652.2814	647.0260	621.1625	581.0888	539.8296	503.2424	482.1710	491.6703	515.0314	555.3363	600.0053	634.0072	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					5.6200	10.6334	0.6300	0.7000	0.7700		18.2633 (74)	
East					0.7200	19.6403	0.6300	0.7000	0.7700		4.3217 (76)	
South					9.1300	46.7521	0.6300	0.7000	0.7700		130.4498 (78)	
West					0.6600	19.6403	0.6300	0.7000	0.7700		3.9615 (80)	

Solar gains	156.9963	264.7490	358.1360	441.7627	496.5426	494.6598	476.1244	434.3690	386.6286	291.2077	187.4858	134.7575 (83)
Total gains	809.2777	911.7750	979.2985	1022.8515	1036.3723	997.9023	958.2954	926.0393	901.6599	846.5440	787.4911	768.7647 (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	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900
alpha	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927
util living area	0.9795	0.9682	0.9490	0.9109	0.8378	0.7108	0.5637	0.5985	0.7820	0.9186	0.9682	0.9827 (86)
MIT	19.2852	19.4875	19.7971	20.1815	20.5514	20.8239	20.9412	20.9261	20.7394	20.2689	19.6945	19.2251 (87)
Th 2	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892 (88)
util rest of house	0.9751	0.9614	0.9374	0.8889	0.7940	0.6274	0.4416	0.4791	0.7113	0.8941	0.9601	0.9789 (89)
MIT 2	18.3468	18.5459	18.8494	19.2206	19.5633	19.7910	19.8683	19.8608	19.7296	19.3102	18.7527	18.2874 (90)
Living area fraction	18.4824	18.6820	18.9864	19.3595	19.7061	19.9403	20.0233	20.0148	19.8755	19.4487	18.8888	18.4230 (91)
MIT	18.4824	18.6820	18.9864	19.3595	19.7061	19.9403	20.0233	20.0148	19.8755	19.4487	18.8888	18.4230 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4824	18.6820	18.9864	19.3595	19.7061	19.9403	20.0233	20.0148	19.8755	19.4487	18.8888	18.4230 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9517	0.9256	0.8762	0.7856	0.6317	0.4574	0.4938	0.7103	0.8820	0.9504	0.9721	(94)
Useful gains	783.0150	867.7104	906.4227	896.2349	814.1676	630.3888	438.3705	457.2537	640.4330	746.6412	748.4566	747.3055	(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	1900.8767	1847.2057	1673.5626	1401.8940	1073.0676	715.7641	458.8336	484.4878	774.0981	1186.0017	1580.0642	1906.3147	(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	831.6891	658.2208	570.7521	364.0746	192.6216	0.0000	0.0000	0.0000	0.0000	326.8842	598.7575	862.3029	(98)

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Space heating 4405.3028 (98)
Space heating per m2 (98) / (4) = 40.7107 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4883.9277 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	831.6891	658.2208	570.7521	364.0746	192.6216	0.0000	0.0000	0.0000	0.0000	326.8842	598.7575	862.3029	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	922.0500	729.7349	632.7629	403.6303	213.5494	0.0000	0.0000	0.0000	0.0000	362.3993	663.8110	955.9899	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(64)
Efficiency of water heater (217)m	87.5801	87.3610	86.9482	86.1090	84.2229	76.4000	76.4000	76.4000	76.4000	85.6788	87.0949	87.7218	(216)
Fuel for water heating, kWh/month	188.4899	165.2944	171.4064	150.9000	148.0078	140.7718	130.4457	149.7154	151.5309	157.4623	169.0605	182.2475	(219)
Water heating fuel used												1905.3326	(219)
Annual totals kWh/year													
Space heating fuel - main system												4883.9277	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												77.4808	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												152.4808	(231)
Electricity for lighting (calculated in Appendix L)												448.2246	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1080 * 1.00) =										-1036.3436		-1036.3436	(233)
Total delivered energy for all uses												6353.6221	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4883.9277	3.4800	169.9607 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1905.3326	3.4800	66.3056 (247)
Mechanical ventilation fans	77.4808	13.1900	10.2197 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	448.2246	13.1900	59.1208 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1036.3436	13.1900	-136.6937 (252)
Total energy cost			298.8056 (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] =	0.8191 (257)
SAP value	88.5732	
SAP rating (Section 12)	89	(258)
SAP band	B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4883.9277	0.2160	1054.9284 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1905.3326	0.2160	411.5518 (264)
Space and water heating			1466.4802 (265)
Pumps and fans	152.4808	0.5190	79.1375 (267)
Energy for lighting	448.2246	0.5190	232.6286 (268)
Energy saving/generation technologies			
PV Unit	-1036.3436	0.5190	-537.8623 (269)
Total kg/year			1240.3840 (272)

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CO2 emissions per m2 11.4600 (273)
EI value 89.1514
EI rating 89 (274)
EI band B

Calculation of stars for heating and DHW

Main heating energy efficiency $3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact $0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency $3.48 / 0.8319 = 4.183$, stars = 4
Water heating environmental impact $0.216 / 0.8319 = 0.2596$, stars = 4

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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	43.8800 (1b)	x 2.6800 (2b)	= 117.5984 (1b) - (3b)
First floor	64.3300 (1c)	x 2.3200 (2c)	= 149.2456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.8440 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour			
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											Air changes per hour		
Pressure test											0.0000 / (5) =		0.0000 (8)
Measured/design AP50											Yes		
Infiltration rate											4.0500		
Number of sides sheltered											0.2025 (18)		
											2 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.1721 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)	
Adj infilt rate	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)	
	0.2022	0.1893	0.1893	0.1721	0.1764	0.1678	0.1678	0.1635	0.1635	0.1764	0.1721	0.1764 (22b)	
Mechanical extract ventilation - centralised													
If mechanical ventilation:													0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)	

3. Heat losses and heat loss parameter

Element	Gross 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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			16.1300	1.1450	18.4695		(27)
Personnel Door			1.7600	1.8000	3.1680		(26)
Ground Floor			43.8800	0.1200	5.2656	84.0000	3685.9200 (28a)
Above Garage			20.4500	0.1388	2.8377	20.0000	409.0000 (28a)
Brick and Block	140.3800	18.2800	122.1000	0.2400	29.3040	42.2200	5155.0620 (29a)
Wall to Garage	14.3100	1.7600	12.5500	0.2400	3.0120	42.2200	529.8610 (29a)
Pitched Roof	64.3300		64.3300	0.1000	6.4330	9.1000	585.4030 (30)
Total net area of external elements Aum(A, m ²)			283.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.8547		(33)
Ground Floor Stud			26.3800			9.0000	237.4200 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			151.5500			9.0000	1363.9500 (32c)
Internal Floor 1			43.8800			18.0000	789.8400 (32d)
Internal Ceiling 1			43.8800			18.0000	789.8400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17317.2960 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0342 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1468 (36)
Total fabric heat loss						(33) + (36) =	90.0015 (37)

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

(38)m	Jan 44.0293	Feb 44.0293	Mar 44.0293	Apr 44.0293	May 44.0293	Jun 44.0293	Jul 44.0293	Aug 44.0293	Sep 44.0293	Oct 44.0293	Nov 44.0293	Dec 44.0293 (38)
Heat transfer coeff	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307 (39)
Average = Sum(39)m / 12 =												134.0307 (39)
HLP	Jan 1.2386	Feb 1.2386	Mar 1.2386	Apr 1.2386	May 1.2386	Jun 1.2386	Jul 1.2386	Aug 1.2386	Sep 1.2386	Oct 1.2386	Nov 1.2386	Dec 1.2386 (40)
HLP (average)												1.2386 (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	2.8036 (42)
Average daily hot water use (litres/day)	100.7865 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.8652	106.8337	102.8023	98.7708	94.7393	90.7079	90.7079	94.7393	98.7708	102.8023	106.8337	110.8652	(44)
Energy conte	164.4099	143.7939	148.3825	129.3634	124.1273	107.1124	99.2554	113.8970	115.2573	134.3213	146.6222	159.2222	(45)
Energy content (annual)	Total = Sum (45)m =												1585.7647 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6615	21.5691	22.2574	19.4045	18.6191	16.0669	14.8883	17.0846	17.2886	20.1482	21.9933	23.8833	(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	0.6697	0.6089	0.6523	0.5750	0.5292	0.4372	0.4051	0.4856	0.5123	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(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	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(64)
Heat gains from water heating, kWh/month	54.8337	47.9637	49.5002	43.1571	41.4046	35.7242	33.1037	37.9921	38.4511	44.8094	48.9071	53.1035	(65)
Total per year (kWh/year) = Sum (64)m =												1592.4999	(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	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.4508	56.3565	45.8322	34.6979	25.9371	21.8972	23.6607	30.7550	41.2793	52.4136	61.1744	65.2143	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	401.4310	405.5966	395.0994	372.7522	344.5428	318.0300	300.3178	296.1522	306.6493	328.9966	357.2059	383.7188	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	(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)	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	(71)
Water heating gains (Table 5)	73.7012	71.3746	66.5326	59.9404	55.6514	49.6169	44.4942	51.0647	53.4043	60.2277	67.9265	71.3757	(72)
Total internal gains	652.2814	647.0260	621.1625	581.0888	539.8296	503.2424	482.1710	491.6703	515.0314	555.3363	600.0053	634.0072	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					5.6200	13.4684		0.6300	0.7000	0.7700		23.1326 (74)	
East					0.7200	25.1733		0.6300	0.7000	0.7700		5.5392 (76)	
South					9.1300	56.5862		0.6300	0.7000	0.7700		157.8895 (78)	
West					0.6600	25.1733		0.6300	0.7000	0.7700		5.0776 (80)	
Solar gains	191.6388	275.0437	379.9037	474.0918	505.3263	558.9589	516.1535	488.1965	430.4510	326.6480	228.0736	155.7538	(83)
Total gains	843.9202	922.0697	1001.0662	1055.1806	1045.1559	1062.2014	998.3245	979.8668	945.4824	881.9843	828.0789	789.7609	(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	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900
alpha	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927
util living area	0.9710	0.9602	0.9340	0.8789	0.7773	0.5834	0.4270	0.4224	0.6765	0.8726	0.9505	0.9755 (86)
MIT	19.5236	19.6654	19.9787	20.3671	20.7077	20.9243	20.9810	20.9822	20.8684	20.4979	19.9622	19.4813 (87)
Th 2	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892 (88)
util rest of house	0.9643	0.9512	0.9184	0.8482	0.7162	0.4778	0.2906	0.2828	0.5785	0.8326	0.9370	0.9697 (89)
MIT 2	18.5828	18.7214	19.0260	19.3946	19.6978	19.8570	19.8854	19.8858	19.8243	19.5219	19.0147	18.5417 (90)
Living area fraction									fLA = Living area / (4) =			0.1445 (91)
MIT	18.7187	18.8579	19.1637	19.5351	19.8437	20.0112	20.0437	20.0443	19.9752	19.6630	19.1517	18.6775 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7187	18.8579	19.1637	19.5351	19.8437	20.0112	20.0437	20.0443	19.9752	19.6630	19.1517	18.6775 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9551	0.9405	0.9058	0.8367	0.7134	0.4902	0.3104	0.3031	0.5869	0.8228	0.9255	0.9613	(94)
Useful gains	806.0410	867.1828	906.7946	882.8222	745.5903	520.7247	309.8436	296.9896	554.9130	725.7348	766.3615	759.2077	(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	1758.3141	1723.3481	1549.8887	1264.5969	903.8683	551.0312	314.1297	300.8040	613.2185	1013.6759	1414.2469	1739.3885	(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	708.4912	575.3431	478.4620	274.8778	117.7588	0.0000	0.0000	0.0000	0.0000	214.2282	466.4775	729.2545	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space heating
Space heating per m2 (98) / (4) = 3564.8932 (98)
32.9442 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3952.2097 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	708.4912	575.3431	478.4620	274.8778	117.7588	0.0000	0.0000	0.0000	0.0000	214.2282	466.4775	729.2545	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	785.4670	637.8527	530.4457	304.7426	130.5530	0.0000	0.0000	0.0000	0.0000	237.5035	517.1591	808.4862	(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	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(64)
Efficiency of water heater	87.2228	87.0455	86.4896	85.2569	82.5339	76.4000	76.4000	76.4000	76.4000	84.3151	86.4534	87.3626	(216)
(217)m													(217)
Fuel for water heating, kWh/month	189.2620	165.8935	172.3153	152.4080	151.0366	140.7718	130.4457	149.7154	151.5309	160.0090	170.3149	182.9968	(219)
Water heating fuel used												1916.6999	(219)
Annual totals kWh/year													
Space heating fuel - main system												3952.2097	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												77.4808	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												152.4808	(231)
Electricity for lighting (calculated in Appendix L)												448.2246	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1206 * 1.00) =										-1157.7698		-1157.7698	(233)
Total delivered energy for all uses												5311.8452	(238)

10a. Fuel costs - using BEDF prices (£550)

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	3952.2097	7.3800	291.6731 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1916.6999	7.3800	141.4525 (247)
Mechanical ventilation fans	77.4808	28.6600	22.2060 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Energy for lighting	448.2246	28.6600	128.4612 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-1157.7698	28.6600	-331.8168 (252)
Total energy cost			380.4709 (255)

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	3952.2097	0.2160	853.6773 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1916.6999	0.2160	414.0072 (264)
Space and water heating			1267.6845 (265)
Pumps and fans	152.4808	0.5190	79.1375 (267)
Energy for lighting	448.2246	0.5190	232.6286 (268)
Energy saving/generation technologies			
PV Unit	-1157.7698	0.5190	-600.8825 (269)
Total kg/year			978.5681 (272)

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

	Energy	Primary energy factor	Primary energy
	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1	3952.2097	1.2200	4821.6959 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1916.6999	1.2200	2338.3738 (264)

FULL SAP CALCULATION PRINTOUT

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Space and water heating			7160.0697 (265)
Pumps and fans	152.4808	3.0700	468.1161 (267)
Energy for lighting	448.2246	3.0700	1376.0496 (268)
Energy saving/generation technologies			
PV Unit	-1157.7698	3.0700	-3554.3533 (269)
Primary energy kWh/year			5449.8821 (272)
Primary energy kWh/m2/year			50.3639 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 89
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	+ 1.1	-£ 66	-209 kg (21.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£66 1.94 kg/m²	B 90	B 91
Total Savings	£66 1.94 kg/m²		

Potential energy efficiency rating: B 90
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 550 TEST (28 Jun 2024)
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	£172	£186	-£14
Mains gas	£540	£460	£80
Space heating	£442	£442	£0
Water heating	£141	£75	£66
Lighting	£128	£128	£0
Generated (PV)	-£332	-£332	£0
Total cost of fuels	£380	£314	£66
Total cost of uses	£379	£313	£66
Delivered energy	49 kWh/m²	39 kWh/m²	10 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.8 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	50 kWh/m²	39 kWh/m²	11 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	43.8800 (1b)	x 2.6800 (2b)	= 117.5984 (1b) - (3b)
First floor	64.3300 (1c)	x 2.3200 (2c)	= 149.2456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.8440 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																0 * 10 =	0.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour		
Pressure test															0.0000 / (5) =		0.0000 (8)
Measured/design AP50															Yes		
Infiltration rate															4.0500		
Number of sides sheltered															0.2025 (18)		
															2 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.1721 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)					
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)					
Adj infilt rate																	
	0.2195	0.2152	0.2109	0.1893	0.1850	0.1635	0.1635	0.1592	0.1721	0.1850	0.1936	0.2022 (22b)					
Mechanical extract ventilation - centralised																	
If mechanical ventilation:																	0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)					

3. Heat losses and heat loss parameter

Element	Gross 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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			16.1300	1.1450	18.4695		(27)
Personnel Door			1.7600	1.8000	3.1680		(26)
Ground Floor			43.8800	0.1200	5.2656	84.0000	3685.9200 (28a)
Above Garage			20.4500	0.1388	2.8377	20.0000	409.0000 (28a)
Brick and Block	140.3800	18.2800	122.1000	0.2400	29.3040	42.2200	5155.0620 (29a)
Wall to Garage	14.3100	1.7600	12.5500	0.2400	3.0120	42.2200	529.8610 (29a)
Pitched Roof	64.3300		64.3300	0.1000	6.4330	9.1000	585.4030 (30)
Total net area of external elements Aum(A, m ²)			283.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.8547		(33)
Ground Floor Stud			26.3800			9.0000	237.4200 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			151.5500			9.0000	1363.9500 (32c)
Internal Floor 1			43.8800			18.0000	789.8400 (32d)
Internal Ceiling 1			43.8800			18.0000	789.8400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17317.2960 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0342 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1468 (36)
Total fabric heat loss						(33) + (36) =	90.0015 (37)

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

(38)m	Jan 44.0293	Feb 44.0293	Mar 44.0293	Apr 44.0293	May 44.0293	Jun 44.0293	Jul 44.0293	Aug 44.0293	Sep 44.0293	Oct 44.0293	Nov 44.0293	Dec 44.0293 (38)
Heat transfer coeff	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307 (39)
Average = Sum(39)m / 12 =												134.0307 (39)
HLP	Jan 1.2386	Feb 1.2386	Mar 1.2386	Apr 1.2386	May 1.2386	Jun 1.2386	Jul 1.2386	Aug 1.2386	Sep 1.2386	Oct 1.2386	Nov 1.2386	Dec 1.2386 (40)
HLP (average)												1.2386 (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	2.8036 (42)
Average daily hot water use (litres/day)	100.7865 (43)

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Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.8652	106.8337	102.8023	98.7708	94.7393	90.7079	90.7079	94.7393	98.7708	102.8023	106.8337	110.8652	(44)
Energy conte	164.4099	143.7939	148.3825	129.3634	124.1273	107.1124	99.2554	113.8970	115.2573	134.3213	146.6222	159.2222	(45)
Energy content (annual)										Total = Sum	(45)m =	1585.7647	(45)
Distribution loss (46)m = 0.15 x (45)m	24.6615	21.5691	22.2574	19.4045	18.6191	16.0669	14.8883	17.0846	17.2886	20.1482	21.9933	23.8833	(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	0.6697	0.6089	0.6523	0.5750	0.5292	0.4372	0.4051	0.4856	0.5123	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(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													1.1437 (H8)
Utilisation factor													0.5829 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													75.0000 (H13)
Daily hot water demand													100.7865 (H14)
Volume ratio Veff/V													0.7441 (H15)
Solar storage volume factor													0.9409 (H16)
Solar input													-874.5694 (H17)
Solar input	-25.3608	-42.3198	-72.0755	-96.5954	-119.3355	-117.3258	-115.7753	-101.1534	-79.2234	-54.1003	-30.0815	-21.2226	(63)
Solar input (sum of months) = Sum(63)m =													-874.5694 (63)
Output from w/h	139.7188	102.0830	76.9592	33.3430	5.3210	0.0000	0.0000	13.2291	36.5462	80.8115	117.1615	138.6481	(64)
Total per year (kWh/year) = Sum(64)m =													743.8215 (64)
Heat gains from water heating, kWh/month	54.8337	47.9637	49.5002	43.1571	41.4046	35.7242	33.1037	37.9921	38.4511	44.8094	48.9071	53.1035	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.4508	56.3565	45.8322	34.6979	25.9371	21.8972	23.6607	30.7550	41.2793	52.4136	61.1744	65.2143	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	401.4310	405.5966	395.0994	372.7522	344.5428	318.0300	300.3178	296.1522	306.6493	328.9966	357.2059	383.7188	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	(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)	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	(71)
Water heating gains (Table 5)	73.7012	71.3746	66.5326	59.9404	55.6514	49.6169	44.4942	51.0647	53.4043	60.2277	67.9265	71.3757	(72)
Total internal gains	652.2814	647.0260	621.1625	581.0888	539.8296	503.2424	482.1710	491.6703	515.0314	555.3363	600.0053	634.0072	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				5.6200	10.6334	0.6300	0.7000	0.7700	18.2633 (74)			
East				0.7200	19.6403	0.6300	0.7000	0.7700	4.3217 (76)			
South				9.1300	46.7521	0.6300	0.7000	0.7700	130.4498 (78)			
West				0.6600	19.6403	0.6300	0.7000	0.7700	3.9615 (80)			
Solar gains	156.9963	264.7490	358.1360	441.7627	496.5426	494.6598	476.1244	434.3690	386.6286	291.2077	187.4858	134.7575 (83)
Total gains	809.2777	911.7750	979.2985	1022.8515	1036.3723	997.9023	958.2954	926.0393	901.6599	846.5440	787.4911	768.7647 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	
alpha	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	
util living area	0.9795	0.9682	0.9490	0.9109	0.8378	0.7108	0.5637	0.5985	0.7820	0.9186	0.9682	0.9827	(86)
MIT	19.2852	19.4875	19.7971	20.1815	20.5514	20.8239	20.9412	20.9261	20.7394	20.2689	19.6945	19.2251	(87)
Th 2	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	(88)
util rest of house	0.9751	0.9614	0.9374	0.8889	0.7940	0.6274	0.4416	0.4791	0.7113	0.8941	0.9601	0.9789	(89)
MIT 2	18.3468	18.5459	18.8494	19.2206	19.5633	19.7910	19.8683	19.8608	19.7296	19.3102	18.7527	18.2874	(90)
Living area fraction										fLA = Living area / (4) =			0.1445 (91)

MIT	18.4824	18.6820	18.9864	19.3595	19.7061	19.9403	20.0233	20.0148	19.8755	19.4487	18.8888	18.4230 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4824	18.6820	18.9864	19.3595	19.7061	19.9403	20.0233	20.0148	19.8755	19.4487	18.8888	18.4230 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP value 89.7192
SAP rating (Section 12) 90 (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	4883.9277	0.2160	1054.9284 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	854.6855	0.2160	184.6121 (264)
Space and water heating			1239.5405 (265)
Pumps and fans	202.4808	0.5190	105.0875 (267)
Energy for lighting	448.2246	0.5190	232.6286 (268)
Energy saving/generation technologies			
PV Unit	-1036.3436	0.5190	-537.8623 (269)
Total kg/year			1039.3942 (272)
CO2 emissions per m2			9.6100 (273)
EI value			90.9093
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	43.8800 (1b)	x 2.6800 (2b)	= 117.5984 (1b) - (3b)
First floor	64.3300 (1c)	x 2.3200 (2c)	= 149.2456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.8440 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												4.0500
Infiltration rate												0.2025 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1721 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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												
	0.2022	0.1893	0.1893	0.1721	0.1764	0.1678	0.1678	0.1635	0.1635	0.1764	0.1721	0.1764 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross 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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			16.1300	1.1450	18.4695		(27)
Personnel Door			1.7600	1.8000	3.1680		(26)
Ground Floor			43.8800	0.1200	5.2656	84.0000	3685.9200 (28a)
Above Garage			20.4500	0.1388	2.8377	20.0000	409.0000 (28a)
Brick and Block	140.3800	18.2800	122.1000	0.2400	29.3040	42.2200	5155.0620 (29a)
Wall to Garage	14.3100	1.7600	12.5500	0.2400	3.0120	42.2200	529.8610 (29a)
Pitched Roof	64.3300		64.3300	0.1000	6.4330	9.1000	585.4030 (30)
Total net area of external elements Aum(A, m ²)			283.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.8547		(33)
Ground Floor Stud			26.3800			9.0000	237.4200 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			151.5500			9.0000	1363.9500 (32c)
Internal Floor 1			43.8800			18.0000	789.8400 (32d)
Internal Ceiling 1			43.8800			18.0000	789.8400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17317.2960 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0342 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1468 (36)
Total fabric heat loss						(33) + (36) =	90.0015 (37)

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

(38)m	Jan 44.0293	Feb 44.0293	Mar 44.0293	Apr 44.0293	May 44.0293	Jun 44.0293	Jul 44.0293	Aug 44.0293	Sep 44.0293	Oct 44.0293	Nov 44.0293	Dec 44.0293 (38)
Heat transfer coeff	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307	134.0307 (39)
Average = Sum(39)m / 12 =												134.0307 (39)
HLP	Jan 1.2386	Feb 1.2386	Mar 1.2386	Apr 1.2386	May 1.2386	Jun 1.2386	Jul 1.2386	Aug 1.2386	Sep 1.2386	Oct 1.2386	Nov 1.2386	Dec 1.2386 (40)
HLP (average)												1.2386 (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	2.8036 (42)
Average daily hot water use (litres/day)	100.7865 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.8652	106.8337	102.8023	98.7708	94.7393	90.7079	90.7079	94.7393	98.7708	102.8023	106.8337	110.8652	(44)
Energy conte	164.4099	143.7939	148.3825	129.3634	124.1273	107.1124	99.2554	113.8970	115.2573	134.3213	146.6222	159.2222	(45)
Energy content (annual)	Total = Sum (45)m =												1585.7647 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6615	21.5691	22.2574	19.4045	18.6191	16.0669	14.8883	17.0846	17.2886	20.1482	21.9933	23.8833	(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	0.6697	0.6089	0.6523	0.5750	0.5292	0.4372	0.4051	0.4856	0.5123	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0796	144.4028	149.0347	129.9384	124.6565	107.5496	99.6605	114.3826	115.7696	134.9117	147.2431	159.8708	(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													1.2777 (H8)
Utilisation factor													0.5428 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													75.0000 (H13)
Daily hot water demand													100.7865 (H14)
Volume ratio Veff/V													0.7441 (H15)
Solar storage volume factor													0.9409 (H16)
Solar input													-909.8898 (H17)
Solar input	-29.6909	-42.2237	-73.2691	-98.5593	-114.5325	-124.5781	-118.1191	-107.7132	-84.3068	-58.2699	-35.1175	-23.5097	(63)
Solar input (sum of months) = Sum (63)m =													-909.8898 (63)
Output from w/h	135.3887	102.1791	75.7657	31.3791	10.1240	0.0000	0.0000	6.6694	31.4627	76.6419	112.1255	136.3611	(64)
Total per year (kWh/year) = Sum (64)m =													718.0972 (64)
Heat gains from water heating, kWh/month	54.8337	47.9637	49.5002	43.1571	41.4046	35.7242	33.1037	37.9921	38.4511	44.8094	48.9071	53.1035	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	168.2186	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.4508	56.3565	45.8322	34.6979	25.9371	21.8972	23.6607	30.7550	41.2793	52.4136	61.1744	65.2143	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	401.4310	405.5966	395.0994	372.7522	344.5428	318.0300	300.3178	296.1522	306.6493	328.9966	357.2059	383.7188	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	54.6255	(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)	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	-112.1458	(71)
Water heating gains (Table 5)	73.7012	71.3746	66.5326	59.9404	55.6514	49.6169	44.4942	51.0647	53.4043	60.2277	67.9265	71.3757	(72)
Total internal gains	652.2814	647.0260	621.1625	581.0888	539.8296	503.2424	482.1710	491.6703	515.0314	555.3363	600.0053	634.0072	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North					5.6200	13.4684		0.6300	0.7000	0.7700		23.1326 (74)
East					0.7200	25.1733		0.6300	0.7000	0.7700		5.5392 (76)
South					9.1300	56.5862		0.6300	0.7000	0.7700		157.8895 (78)
West					0.6600	25.1733		0.6300	0.7000	0.7700		5.0776 (80)

Solar gains	191.6388	275.0437	379.9037	474.0918	505.3263	558.9589	516.1535	488.1965	430.4510	326.6480	228.0736	155.7538 (83)
Total gains	843.9202	922.0697	1001.0662	1055.1806	1045.1559	1062.2014	998.3245	979.8668	945.4824	881.9843	828.0789	789.7609 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	35.8900	
alpha	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	3.3927	
util living area	0.9710	0.9602	0.9340	0.8789	0.7773	0.5834	0.4270	0.4224	0.6765	0.8726	0.9505	0.9755	(86)
MIT	19.5236	19.6654	19.9787	20.3671	20.7077	20.9243	20.9810	20.9822	20.8684	20.4979	19.9622	19.4813	(87)
Th 2	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	19.8892	(88)
util rest of house	0.9643	0.9512	0.9184	0.8482	0.7162	0.4778	0.2906	0.2828	0.5785	0.8326	0.9370	0.9697	(89)
MIT 2	18.5828	18.7214	19.0260	19.3946	19.6978	19.8570	19.8854	19.8858	19.8243	19.5219	19.0147	18.5417	(90)
Living area fraction	fLA = Living area / (4) =												0.1445 (91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space heating - main system 1	3952.2097	0.2160	853.6773 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	826.7637	0.2160	178.5810 (264)
Space and water heating			1032.2583 (265)
Pumps and fans	202.4808	0.5190	105.0875 (267)
Energy for lighting	448.2246	0.5190	232.6286 (268)
Energy saving/generation technologies			
PV Unit	-1157.7698	0.5190	-600.8825 (269)
Total kg/year			769.0918 (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	3952.2097	1.2200	4821.6959 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	826.7637	1.2200	1008.6517 (264)
Space and water heating			5830.3476 (265)
Pumps and fans	202.4808	3.0700	621.6161 (267)
Energy for lighting	448.2246	3.0700	1376.0496 (268)
Energy saving/generation technologies			
PV Unit	-1157.7698	3.0700	-3554.3533 (269)
Primary energy kWh/year			4273.6599 (272)
Primary energy kWh/m2/year			39.4941 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 8	Issued on Date	10/07/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Project	17, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	13.16	TER	18.33
Environmental	89 B	% DER<TER	28.22		
CO ₂ Emissions (t/year)	0.98	DFEE	52.48	TFEE	59.30
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Mineral wool batt						
	Main construction	350	0.0380	9.2105	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Mineral wool batt						
	Main construction	100	0.0380	2.6316	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

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

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 8	Issued on Date	10/07/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Project	17, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	13.16	TER	18.33
Environmental	89 B	% DER<TER	28.22		
CO ₂ Emissions (t/year)	0.98	DFEE	52.48	TFEE	59.30
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		

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

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 8	Issued on Date	10/07/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Project	17, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	13.16	TER	18.33
Environmental	89 B	% DER<TER	28.22		
CO ₂ Emissions (t/year)	0.98	DFEE	52.48	TFEE	59.30
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		

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

Wall 000005

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	Blockwork, dense						
	Main construction	100	1.5900	0.0629	93.18		
	Main construction	100	0.8800	0.1136	6.82		
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 = 4.259 m ² K/W	Lower limit = 4.047 m ² K/W	Average = 4.153 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: 328 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 8	Issued on Date	10/07/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Project	17, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	13.16	TER	18.33
Environmental	89 B	% DER<TER	28.22		
CO ₂ Emissions (t/year)	0.98	DFEE	52.48	TFEE	59.30
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 34.96 m², Perimeter = 16.87 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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 8	Issued on Date	10/07/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Project	17, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	13.16	TER	18.33
Environmental	89 B	% DER<TER	28.22		
CO ₂ Emissions (t/year)	0.98	DFEE	52.48	TFEE	59.30
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		

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

Floor 000006 - New exposed above Garage

Floor Type: Exposed Floor

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Plasterboard, high density				
	Main construction	15	0.2500	0.0600	100.00
Layer 2	Celotex GA4000				
	Main construction	50	0.0220	2.2727	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Polythene, 500 gauge				
	Main construction	0.5	0.0000	0.0000	100.00
Layer 4	Mineral wool batt				
	Main construction	290	0.0380	7.6316	98.75
	Main construction	290	50.0000	0.0058	1.25
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 5	Chipboard				
	Main construction	22	0.1300	0.1692	100.00
Int surface				0.1700	

Total resistance:	Upper limit = 9.993 m ² K/W	Lower limit = 3.150 m ² K/W	Average = 6.571 m ² K/W
	Total correction = 0.0012 m ² K/W	U-value (unrounded) = 0.15 W/m ² K	

Unheated space: None

Total thickness: 378 mm

U-value: 0.15 W/m² K

Kappa: n/a

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 8			Issued on Date	10/07/2024
Assessment Reference	As Built	Prop Type Ref	Type A		
Property	17, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	89 B	DER	13.16	TER	18.33
Environmental	89 B	% DER<TER	28.22		
CO ₂ Emissions (t/year)	0.98	DFEE	52.48	TFEE	59.30
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	27.75 m	43.88 m ²	2.68 m
	1st Storey:	34.62 m	64.33 m ²	2.32 m

7.0 Living Area	15.64	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	160.03	kJ/m ² K

9.0 External Walls							
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)	
Brick and Block	Cavity Wall	Other	0.24	42.22	140.38	122.10	
Wall to Garage	Cavity Wall	Other	0.24	42.22	14.31	12.55	

9.1 Party Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
		Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill		110.00		

9.2 Internal Walls					
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)	
Ground Floor Stud	Plasterboard on timber frame		9.00	26.38	
Ground Floor Block	Dense block, plasterboard on dabs		75.00	50.28	
First Floor Stud	Plasterboard on timber frame		9.00	151.55	

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	64.33	64.33

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	43.88

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	43.88
Above Garage	Ground Floor - Timber	Suspended timber, insulation between joists	0.15	20.00	20.45

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.88

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
Personnel Door	Manufacturer	Solid Door							1.80

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	North							2.15	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					5.62	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					0.72	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					9.13	
Side Elevation	Window	[1] Brick and Block	West	None	0.00					0.66	
Personnel Door	Solid Door	[2] Wall to Garage	East							1.76	

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.69	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	0.84	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	9.98	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E3 Sill	10.66	0.021	No	Knauf P5
Independently assessed	E4 Jamb	34.05	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	27.75	0.320	No	
Table K1 - Default	E20 Exposed floor (normal)	12.77	0.320	No	
Table K1 - Default	E21 Exposed floor (inverted)	6.00	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	21.83	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	23.74	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	10.88	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	22.31	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	2.32	-0.091	No	Knauf P24

Y-value W/m²K

18.0 Pressure Testing

Yes
 Designed AP₅₀ m³/(h.m²) @ 50 Pa
 Property Tested ?
 As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present
 Approved Installation
 Mechanical Ventilation data Type
 Type
 MV Reference Number
 Configuration
 Manufacturer SFP
 Duct Type
 Wet Rooms

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings
 Total number of L.E.L. fittings

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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.	17960	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	76.4	
Controls	CBV Programmer and at least two room thermostats	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2105	
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	None	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 1	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	901	
29.0 Hot Water Cylinder	None	
32.0 Photovoltaic Unit	One Dwelling	
PV Cells kWp	Orientation	Elevation
1.20	South	30°
	Overshading	Connected to Dwelling
	None Or Little	Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)



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	£66	B 90	