



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 31 , Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 07/01/2025

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 15			Issued on Date	07/01/2025
Assessment Reference	As Built	Prop Type Ref	Type A		
Property	31 , Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	14.21	TER	18.69
Environmental	88 B	% DER<TER	23.96		
CO ₂ Emissions (t/year)	1.08	DFEE	54.16	TFEE	61.34
General Requirements Compliance	Pass	% DFEE<TFEE	11.71		
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)	18.69	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.21	kgCO ₂ /m ²	Pass
	-4.48 (-24.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.34	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	54.16	kWh/m ² /yr	
	-7.1 (-11.6%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.13 (max. 0.25)	0.15 (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	4.02 (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

0.66 m², No overhang

Windows facing East

5.62 m², No overhang

Windows facing South

0.72 m², No overhang

Windows facing West

9.13 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

4.02 (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	1.23	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 15				Issued on Date	07/01/2025
Assessment Reference	As Built	Prop Type Ref	Type A			
Property	31 , Shaw Crescent, West End, Southampton, SO30 3LH					
SAP Rating		88 B	DER	14.21	TER	18.69
Environmental		88 B	% DER<TER	23.96		
CO ₂ Emissions (t/year)		1.08	DFEE	54.16	TFEE	61.34
General Requirements Compliance		Pass	% DFEE<TFEE	11.71		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

	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	11.23	0.72	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	11.92	0.25	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	27.80	8.90	
External wall	E20 Exposed floor (normal)	Table K1 - Default	0.320	12.76	4.08	
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	21.71	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	16.90	1.01	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	10.92	0.48	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	22.32	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: **18.86** W/mK:
Y-Value: **0.067** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 15			Issued on Date	07/01/2025
Assessment Reference	As Built	Prop Type Ref	Type A		
Property	31 , Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	14.21	TER	18.69
Environmental	88 B	% DER<TER	23.96		
CO ₂ Emissions (t/year)	1.08	DFEE	54.16	TFEE	61.34
General Requirements Compliance	Pass	% DFEE<TFEE	11.71		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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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) 18.69 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.21 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)54.2 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)	0.15 (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:	4.02 (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: 0.66 m², No overhang

Windows facing East: 5.62 m², No overhang

Windows facing South: 0.72 m², No overhang

Windows facing West: 9.13 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 1.23 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	43.9100 (1b)	x 2.6800 (2b)	= 117.6788 (1b) - (3b)
First floor	64.1300 (1c)	x 2.3200 (2c)	= 148.7816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.4604 (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					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					4.0200
Infiltration rate					0.2010 (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)	=	0.1709 (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	0.2178	0.2136	0.2093	0.1879	0.1837	0.1623	0.1623	0.1580	0.1709	0.1837	0.1922	0.2007 (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			43.9100	0.1200	5.2692	84.0000	3688.4400 (28a)
Above Garage			20.2200	0.1500	3.0330	20.0000	404.4000 (28a)
Brick and Block	140.1100	18.2800	121.8300	0.2400	29.2392	42.2200	5143.6626 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2400	3.0240	42.2200	531.9720 (29a)
Pitched Roof	64.1300		64.1300	0.1000	6.4130	9.1000	583.5830 (30)
Total net area of external elements Aum(A, m ²)			282.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.9809		(33)
Ground Floor Stud			29.9600			9.0000	269.6400 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			147.0500			9.0000	1323.4500 (32c)
Internal Floor 1			43.9100			18.0000	790.3800 (32d)
Internal Ceiling 1			43.9100			18.0000	790.3800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17296.9076 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0973 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.8578 (36)
Total fabric heat loss						(33) + (36) =	89.8386 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660 (38)
Heat transfer coeff	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046 (39)
Average = Sum(39)m / 12 =												133.8046 (39)
HLP	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385 (40)
HLP (average)												1.2385 (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	2.8025 (42)
Average daily hot water use (litres/day)	100.7602 (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	110.8362	106.8058	102.7754	98.7450	94.7146	90.6842	90.6842	94.7146	98.7450	102.7754	106.8058	110.8362	(44)
Energy conte	164.3669	143.7564	148.3437	129.3296	124.0948	107.0844	99.2295	113.8673	115.2272	134.2862	146.5839	159.1806	(45)
Energy content (annual)										Total =	Sum (45)m =	1585.3504	(45)
Distribution loss (46)m = 0.15 x (45)m	24.6550	21.5635	22.2516	19.3994	18.6142	16.0627	14.8844	17.0801	17.2841	20.1429	21.9876	23.8771	(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	0.5747	0.5289	0.4370	0.4049	0.4853	0.5120	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(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	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(64)
Heat gains from water heating, kWh/month	54.8194	47.9512	49.4873	43.1458	41.3938	35.7148	33.0950	37.9822	38.4410	44.7978	48.8944	53.0897	(65)
Total per year (kWh/year) = Sum (64)m = 1592.0841 (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	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3484	22.5142	18.3098	13.8617	10.3618	8.7479	9.4524	12.2865	16.4910	20.9391	24.4390	26.0529	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.7094	271.4977	264.4711	249.5124	230.6296	212.8825	201.0263	198.2380	205.2646	220.2233	239.1061	256.8532	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	(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)	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	(71)
Water heating gains (Table 5)	73.6820	71.3560	66.5152	59.9247	55.6368	49.6039	44.4826	51.0513	53.3903	60.2121	67.9088	71.3571	(72)
Total internal gains	435.7778	433.4060	417.3342	391.3368	364.6662	339.2723	322.9993	329.6139	343.1839	369.4125	399.4919	422.3013	(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					0.6600	10.6334	0.6300	0.7000			0.7700			2.1448 (74)
East					5.6200	19.6403	0.6300	0.7000			0.7700			33.7330 (76)
South					0.7200	46.7521	0.6300	0.7000			0.7700			10.2874 (78)
West					9.1300	19.6403	0.6300	0.7000			0.7700			54.8012 (80)
Solar gains	100.9664	194.1386	313.6485	451.4230	550.1453	562.3279	535.6706	461.8104	362.5182	228.5579	125.2317			83.4835 (83)
Total gains	536.7442	627.5446	730.9827	842.7598	914.8115	901.6002	858.6699	791.4243	705.7021	597.9704	524.7236			505.7848 (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	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083
alpha	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939
util living area	0.9940	0.9892	0.9770	0.9446	0.8742	0.7521	0.6117	0.6676	0.8634	0.9667	0.9902	0.9951 (86)
MIT	18.9795	19.1785	19.5437	20.0224	20.4719	20.7883	20.9246	20.8965	20.6271	20.0337	19.4080	18.9277 (87)
Th 2	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893 (88)
util rest of house	0.9926	0.9866	0.9712	0.9293	0.8365	0.6716	0.4853	0.5452	0.8070	0.9549	0.9874	0.9939 (89)
MIT 2	18.0445	18.2424	18.6046	19.0731	19.4968	19.7680	19.8615	19.8473	19.6457	19.0912	18.4721	17.9929 (90)
Living area fraction									fLA = Living area / (4) =			0.1449 (91)
MIT	18.1800	18.3781	18.7407	19.2107	19.6381	19.9159	20.0156	19.9994	19.7879	19.2278	18.6077	18.1284 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1800	18.3781	18.7407	19.2107	19.6381	19.9159	20.0156	19.9994	19.7879	19.2278	18.6077	18.1284 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9894	0.9817	0.9631	0.9175	0.8263	0.6738	0.5010	0.5588	0.8007	0.9453	0.9828	0.9913	(94)
Useful gains	531.0705	616.0582	704.0186	773.2213	755.9336	607.5304	430.1994	442.2331	565.0263	565.2388	515.6857	501.3634	(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	1857.2087	1803.4342	1637.8624	1379.6148	1062.1573	711.2870	457.0205	481.6100	761.0698	1154.4388	1539.7884	1863.6840	(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	986.6469	797.9167	694.7798	436.6033	227.8304	0.0000	0.0000	0.0000	0.0000	438.3648	737.3539	1013.5665	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating 5333.0623 (98)
Space heating per m2 (98) / (4) = 49.3619 (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 5912.4859 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	986.6469	797.9167	694.7798	436.6033	227.8304	0.0000	0.0000	0.0000	0.0000	438.3648	737.3539	1013.5665 (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)	1093.8435	884.6083	770.2659	484.0392	252.5836	0.0000	0.0000	0.0000	0.0000	485.9920	817.4655	1123.6879 (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	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292 (64)
Efficiency of water heater (217)m	87.9242	87.7710	87.4119	86.6126	84.7849	76.4000	76.4000	76.4000	76.4000	86.5228	87.5678	76.4000 (216)
Fuel for water heating, kWh/month	187.7034	164.4794	170.4527	149.9832	146.9881	140.7348	130.4115	149.6761	151.4911	155.8856	168.1038	181.5538 (219)
Water heating fuel used												1897.4636 (219)
Annual totals kWh/year												
Space heating fuel - main system												5912.4859 (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) 77.3694 (230a)
central heating pump 30.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 152.3694 (231)
Electricity for lighting (calculated in Appendix L) 447.6609 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV Unit 0 (0.80 * 1.23 * 908 * 1.00) = -893.3286
Total delivered energy for all uses -893.3286 (233)
7516.6513 (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	5912.4859	0.2160	1277.0970 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1897.4636	0.2160	409.8521 (264)
Space and water heating			1686.9491 (265)
Pumps and fans	152.3694	0.5190	79.0797 (267)
Energy for lighting	447.6609	0.5190	232.3360 (268)
Energy saving/generation technologies			
PV Unit	-893.3286	0.5190	-463.6375 (269)
Total CO2, kg/year			1534.7273 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2100 (273)

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

	TFA N	EF	
DER			14.2100 ZC1
Total Floor Area	108.0400		
Assumed number of occupants	2.8025		
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190		
CO2 emissions from appliances, equation (L14)			14.7382 ZC2
CO2 emissions from cooking, equation (L16)			1.7240 ZC3
Total CO2 emissions			30.6722 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			30.6722 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.9100 (1b)	x 2.6800 (2b)	= 117.6788 (1b) - (3b)
First floor	64.1300 (1c)	x 2.3200 (2c)	= 148.7816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.4604 (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) = 0.1501 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4001 (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) =				0.3401 (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	0.4336	0.4251	0.4166	0.3741	0.3656	0.3231	0.3231	0.3146	0.3401	0.3656	0.3826	0.3996 (22b)
Effective ac	0.5940	0.5904	0.5868	0.5700	0.5668	0.5522	0.5522	0.5495	0.5578	0.5668	0.5732	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			43.9100	0.1300	5.7083		(28a)
Above Garage			20.2200	0.1300	2.6286		(28a)
Brick and Block	140.1100	18.2800	121.8300	0.1800	21.9294		(29a)
Wall to Garage	14.3600	1.7600	12.6000	0.1800	2.2680		(29a)
Pitched Roof	64.1300		64.1300	0.1300	8.3369		(30)
Total net area of external elements Aum(A, m ²)			282.7300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.1657		(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)							16.9874 (36)
Total fabric heat loss						(33) + (36) =	83.1531 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	52.2329	51.9119	51.5973	50.1193	49.8428	48.5556	48.5556	48.3172	49.0514	49.8428	50.4022	50.9870 (38)
Heat transfer coeff	135.3860	135.0650	134.7503	133.2724	132.9959	131.7086	131.7086	131.4702	132.2045	132.9959	133.5553	134.1401 (39)
Average = Sum(39)m / 12 =												133.2711 (39)
HLP	1.2531	1.2501	1.2472	1.2335	1.2310	1.2191	1.2191	1.2169	1.2237	1.2310	1.2362	1.2416 (40)
HLP (average)												1.2335 (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												2.8025 (42)
Average daily hot water use (litres/day)												100.7602 (43)
Daily hot water use	110.8362	106.8058	102.7754	98.7450	94.7146	90.6842	90.6842	94.7146	98.7450	102.7754	106.8058	110.8362 (44)
Energy conte	164.3669	143.7564	148.3437	129.3296	124.0948	107.0844	99.2295	113.8673	115.2272	134.2862	146.5839	159.1806 (45)
Energy content (annual)										Total = Sum(45)m =		1585.3504 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6550	21.5635	22.2516	19.3994	18.6142	16.0627	14.8844	17.0801	17.2841	20.1429	21.9876	23.8771 (46)
Water storage loss:												
Total storage loss												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	50.9589	46.0274	50.9589	48.6962	48.2655	44.7210	46.2117	48.2655	48.6962	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	215.3258	189.7838	199.3026	178.0258	172.3604	151.8054	145.4411	162.1328	163.9234	185.2451	195.8989	210.1395 (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	215.3258	189.7838	199.3026	178.0258	172.3604	151.8054	145.4411	162.1328	163.9234	185.2451	195.8989	210.1395 (64)
Heat gains from water heating, kWh/month	67.3917	59.3058	62.0640	55.1761	53.3279	46.7858	44.5467	49.9272	50.4871	57.3899	61.0679	65.6673 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3484	22.5142	18.3098	13.8617	10.3618	8.7479	9.4524	12.2865	16.4910	20.9391	24.4390	26.0529	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.7094	271.4977	264.4711	249.5124	230.6296	212.8825	201.0263	198.2380	205.2646	220.2233	239.1061	256.8532	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	(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)	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	(71)
Water heating gains (Table 5)	90.5803	88.2527	83.4194	76.6335	71.6773	64.9803	59.8746	67.1065	70.1209	77.1369	84.8165	88.2625	(72)
Total internal gains	452.6761	450.3027	434.2383	408.0456	380.7067	354.6487	338.3913	345.6690	359.9145	386.3374	416.3996	439.2066	(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				0.6600	10.6334	0.6300	0.7000	0.7700	2.1448 (74)				
East				5.6200	19.6403	0.6300	0.7000	0.7700	33.7330 (76)				
South				0.7200	46.7521	0.6300	0.7000	0.7700	10.2874 (78)				
West				9.1300	19.6403	0.6300	0.7000	0.7700	54.8012 (80)				
Solar gains	100.9664	194.1386	313.6485	451.4230	550.1453	562.3279	535.6706	461.8104	362.5182	228.5579	125.2317	83.4835	(83)
Total gains	553.6425	644.4414	747.8868	859.4686	930.8520	916.9765	874.0619	807.4794	722.4327	614.8953	541.6313	522.6901	(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	55.4177	55.5494	55.6791	56.2966	56.4136	56.9650	56.9650	57.0683	56.7513	56.4136	56.1773	55.9324	
alpha	4.6945	4.7033	4.7119	4.7531	4.7609	4.7977	4.7977	4.8046	4.7834	4.7609	4.7452	4.7288	
util living area	0.9990	0.9977	0.9933	0.9759	0.9206	0.7909	0.6287	0.6913	0.9079	0.9882	0.9979	0.9992	(86)
MIT	19.5428	19.6925	19.9656	20.3374	20.6746	20.8990	20.9743	20.9600	20.7802	20.3357	19.8738	19.5198	(87)
Th 2	19.8777	19.8801	19.8824	19.8933	19.8953	19.9048	19.9048	19.9065	19.9011	19.8953	19.8912	19.8869	(88)
util rest of house	0.9986	0.9969	0.9907	0.9656	0.8847	0.6999	0.4890	0.5537	0.8508	0.9816	0.9971	0.9990	(89)
MIT 2	17.9330	18.1535	18.5534	19.0967	19.5610	19.8332	19.8949	19.8890	19.7098	19.1015	18.4267	17.9056	(90)
Living area fraction	18.1664	18.3766	18.7581	19.2765	19.7224	19.9877	20.0514	20.0443	19.8650	19.2804	18.6365	18.1396	(92)
Temperature adjustment	18.1664	18.3766	18.7581	19.2765	19.7224	19.9877	20.0514	20.0443	19.8650	19.2804	18.6365	18.1396	(92)
adjusted MIT	18.1664	18.3766	18.7581	19.2765	19.7224	19.9877	20.0514	20.0443	19.8650	19.2804	18.6365	18.1396	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9977	0.9951	0.9868	0.9578	0.8776	0.7078	0.5090	0.5727	0.8485	0.9761	0.9954	0.9983	(94)
Ext temp.	552.3767	641.2816	737.9951	823.1954	816.9496	648.9901	444.8809	462.4382	612.9532	600.1832	539.1641	521.7814	(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	1877.3119	1820.2130	1651.7787	1382.9068	1066.9444	709.6085	454.5741	479.1109	762.1558	1154.4568	1540.7569	1869.8603	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	985.7518	792.2419	679.8551	402.9922	185.9962	0.0000	0.0000	0.0000	0.0000	412.3796	721.1468	1002.9707	(98)
Space heating per m2												5183.3343	(98)
												47.9761	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5549.6085 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	985.7518	792.2419	679.8551	402.9922	185.9962	0.0000	0.0000	0.0000	0.0000	412.3796	721.1468	1002.9707	(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)	1055.4087	848.2248	727.8962	431.4692	199.1394	0.0000	0.0000	0.0000	0.0000	441.5199	772.1058	1073.8445	(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	215.3258	189.7838	199.3026	178.0258	172.3604	151.8054	145.4411	162.1328	163.9234	185.2451	195.8989	210.1395	(64)
Efficiency of water heater (217)m	88.4065	88.2547	87.8938	87.0454	85.2431	80.3000	80.3000	80.3000	80.3000	87.0078	88.0346	88.4724	(216)
Fuel for water heating, kWh/month	243.5633	215.0409	226.7538	204.5207	202.1986	189.0478	181.1222	201.9088	204.1387	212.9063	222.5249	237.5199	(219)
Water heating fuel used												2541.2458	(219)
Annual totals kWh/year													
Space heating fuel - main system												5549.6085	(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)												447.6609	(232)
Total delivered energy for all uses												8613.5152	(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	5549.6085	0.2160	1198.7154 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2541.2458	0.2160	548.9091 (264)
Space and water heating			1747.6245 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	447.6609	0.5190	232.3360 (268)
Total CO2, kg/m2/year			2018.8855 (272)
Emissions per m2 for space and water heating			16.1757 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1505 (272b)
Emissions per m2 for pumps and fans			0.3603 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.1757 * 1.00) + 2.1505 + 0.3603, rounded to 2 d.p.			18.6900 (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	43.9100 (1b)	x 2.6800 (2b)	= 117.6788 (1b) - (3b)
First floor	64.1300 (1c)	x 2.3200 (2c)	= 148.7816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.4604 (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) =	0.1501 (8)
Pressure test					Yes
Measured/design AP50					4.0200
Infiltration rate					0.3511 (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) =		0.2984 (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	0.3805	0.3731	0.3656	0.3283	0.3208	0.2835	0.2835	0.2761	0.2984	0.3208	0.3358	0.3507 (22b)
Effective ac	0.5724	0.5696	0.5668	0.5539	0.5515	0.5402	0.5402	0.5381	0.5445	0.5515	0.5564	0.5615 (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			43.9100	0.1200	5.2692	84.0000	3688.4400 (28a)
Above Garage			20.2200	0.1500	3.0330	20.0000	404.4000 (28a)
Brick and Block	140.1100	18.2800	121.8300	0.2400	29.2392	42.2200	5143.6626 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2400	3.0240	42.2200	531.9720 (29a)
Pitched Roof	64.1300		64.1300	0.1000	6.4130	9.1000	583.5830 (30)
Total net area of external elements Aum(A, m ²)			282.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.9809		(33)
Ground Floor Stud			29.9600			9.0000	269.6400 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			147.0500			9.0000	1323.4500 (32c)
Internal Floor 1			43.9100			18.0000	790.3800 (32d)
Internal Ceiling 1			43.9100			9.0000	395.1900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16901.7176 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.4394 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.8578 (36)
Total fabric heat loss						(33) + (36) =	89.8386 (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	50.3321	50.0849	49.8426	48.7045	48.4915	47.5003	47.5003	47.3167	47.8821	48.4915	48.9223	49.3727 (38)
Heat transfer coeff	140.1707	139.9235	139.6812	138.5431	138.3302	137.3389	137.3389	137.1553	137.7207	138.3302	138.7609	139.2113 (39)
Average = Sum(39)m / 12 =												138.5421 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2974	1.2951	1.2929	1.2823	1.2804	1.2712	1.2712	1.2695	1.2747	1.2804	1.2843	1.2885 (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											
Average daily hot water use (litres/day)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use											

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Energy conte	110.8362	106.8058	102.7754	98.7450	94.7146	90.6842	90.6842	94.7146	98.7450	102.7754	106.8058	110.8362 (44)
Energy content (annual)	164.3669	143.7564	148.3437	129.3296	124.0948	107.0844	99.2295	113.8673	115.2272	134.2862	146.5839	159.1806 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1585.3504 (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	34.9280	30.5482	31.5230	27.4825	26.3702	22.7554	21.0863	24.1968	24.4858	28.5358	31.1491	33.8259 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3484	22.5142	18.3098	13.8617	10.3618	8.7479	9.4524	12.2865	16.4910	20.9391	24.4390	26.0529	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.7094	271.4977	264.4711	249.5124	230.6296	212.8825	201.0263	198.2380	205.2646	220.2233	239.1061	256.8532	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	(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)	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	(71)
Water heating gains (Table 5)	46.9462	45.4587	42.3697	38.1702	35.4438	31.6048	28.3417	32.5226	34.0080	38.3546	43.2626	45.4649	(72)
Total internal gains	406.0420	404.5087	390.1886	366.5823	341.4732	318.2732	303.8585	308.0851	320.8016	344.5550	371.8457	393.4090	(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	0.6600	10.6334	0.6300	0.7000	0.7700	2.1448	(74)
East	5.6200	19.6403	0.6300	0.7000	0.7700	33.7330	(76)
South	0.7200	46.7521	0.6300	0.7000	0.7700	10.2874	(78)
West	9.1300	19.6403	0.6300	0.7000	0.7700	54.8012	(80)

Solar gains	100.9664	194.1386	313.6485	451.4230	550.1453	562.3279	535.6706	461.8104	362.5182	228.5579	125.2317	83.4835	(83)
Total gains	507.0084	598.6473	703.8371	818.0053	891.6185	880.6010	839.5291	769.8955	683.3198	573.1129	497.0774	476.8925	(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	33.4943	33.5535	33.6117	33.8878	33.9400	34.1849	34.1849	34.2307	34.0902	33.9400	33.8346	33.7252	
alpha	3.2330	3.2369	3.2408	3.2592	3.2627	3.2790	3.2790	3.2820	3.2727	3.2627	3.2556	3.2483	
util living area	0.9944	0.9899	0.9785	0.9482	0.8826	0.7656	0.6289	0.6853	0.8737	0.9695	0.9910	0.9954	(86)
MIT	18.8159	19.0247	19.4087	19.9248	20.4034	20.7549	20.9087	20.8763	20.5775	19.9455	19.2866	18.7785	(87)
Th 2	19.8429	19.8447	19.8464	19.8547	19.8562	19.8635	19.8635	19.8648	19.8607	19.8562	19.8531	19.8498	(88)
util rest of house	0.9931	0.9875	0.9731	0.9337	0.8464	0.6859	0.4998	0.5617	0.8196	0.9585	0.9884	0.9944	(89)
MIT 2	17.8509	18.0600	18.4424	18.9548	19.4101	19.7212	19.8292	19.8136	19.5817	18.9832	18.3280	17.8185	(90)
Living area fraction	17.9907	18.1998	18.5825	19.0954	19.5540	19.8710	19.9857	19.9677	19.7260	19.1227	18.4670	17.9576	(92)
Temperature adjustment	17.9907	18.1998	18.5825	19.0954	19.5540	19.8710	19.9857	19.9677	19.7260	19.1227	18.4670	17.9576	(93)
adjusted MIT	17.9907	18.1998	18.5825	19.0954	19.5540	19.8710	19.9857	19.9677	19.7260	19.1227	18.4670	17.9576	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	501.9448	588.2292	679.1216	753.6857	744.2457	604.5476	432.5014	442.2788	554.5832	543.7631	489.0872	472.9670	(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	1919.0399	1860.9534	1687.6918	1412.5041	1086.4518	723.9156	464.9832	489.3227	774.8168	1178.9430	1577.2921	1915.2197	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1054.3187	855.2707	750.3762	474.3493	254.6014	0.0000	0.0000	0.0000	0.0000	472.5739	783.5075	1073.0360	(98)
Space heating												5718.0336	(98)
Space heating per m2												52.9252	(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	1290.9856	1016.3078	1042.3804	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7163	0.7920	0.7541	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	924.7317	804.8874	786.0193	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1139.1443	1088.7889	1009.5633	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	154.3770	211.2227	166.3167	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction									FC = cooled area / (4) =			531.9164	(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	38.5943	52.8057	41.5792	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													
Space cooling per m2												132.9791	(107)
Energy for space heating												1.2308	(108)
Energy for space cooling												52.9252	(99)
Total												1.2308	(108)
Dwelling Fabric Energy Efficiency (DFEE)												54.1560	(109)
												54.2	(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	43.9100 (1b)	x 2.6800 (2b)	= 117.6788 (1b) - (3b)
First floor	64.1300 (1c)	x 2.3200 (2c)	= 148.7816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.4604 (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) = 0.1501 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4001 (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) =	0.3401 (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	0.4336	0.4251	0.4166	0.3741	0.3656	0.3231	0.3231	0.3146	0.3401	0.3656	0.3826	0.3996 (22b)
Effective ac	0.5940	0.5904	0.5868	0.5700	0.5668	0.5522	0.5522	0.5495	0.5578	0.5668	0.5732	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			43.9100	0.1300	5.7083		(28a)
Above Garage			20.2200	0.1300	2.6286		(28a)
Brick and Block	140.1100	18.2800	121.8300	0.1800	21.9294		(29a)
Wall to Garage	14.3600	1.7600	12.6000	0.1800	2.2680		(29a)
Pitched Roof	64.1300		64.1300	0.1300	8.3369		(30)
Total net area of external elements Aum(A, m ²)			282.7300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.1657		(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)							16.9874 (36)
Total fabric heat loss						(33) + (36) =	83.1531 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	52.2329	51.9119	51.5973	50.1193	49.8428	48.5556	48.5556	48.3172	49.0514	49.8428	50.4022	50.9870 (38)
Heat transfer coeff	135.3860	135.0650	134.7503	133.2724	132.9959	131.7086	131.7086	131.4702	132.2045	132.9959	133.5553	134.1401 (39)
Average = Sum(39)m / 12 =												133.2711 (39)
HLP	1.2531	1.2501	1.2472	1.2335	1.2310	1.2191	1.2191	1.2169	1.2237	1.2310	1.2362	1.2416 (40)
HLP (average)												1.2335 (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												2.8025 (42)
Average daily hot water use (litres/day)												100.7602 (43)
Daily hot water use	110.8362	106.8058	102.7754	98.7450	94.7146	90.6842	90.6842	94.7146	98.7450	102.7754	106.8058	110.8362 (44)
Energy conte	164.3669	143.7564	148.3437	129.3296	124.0948	107.0844	99.2295	113.8673	115.2272	134.2862	146.5839	159.1806 (45)
Energy content (annual)										Total = Sum(45)m =		1585.3504 (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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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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)
	34.9280	30.5482	31.5230	27.4825	26.3702	22.7554	21.0863	24.1968	24.4858	28.5358	31.1491	33.8259 (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	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267	140.1267 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3484	22.5142	18.3098	13.8617	10.3618	8.7479	9.4524	12.2865	16.4910	20.9391	24.4390	26.0529 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.7094	271.4977	264.4711	249.5124	230.6296	212.8825	201.0263	198.2380	205.2646	220.2233	239.1061	256.8532 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127	37.0127 (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)	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014 (71)
Water heating gains (Table 5)	46.9462	45.4587	42.3697	38.1702	35.4438	31.6048	28.3417	32.5226	34.0080	38.3546	43.2626	45.4649 (72)
Total internal gains	406.0420	404.5087	390.1886	366.5823	341.4732	318.2732	303.8585	308.0851	320.8016	344.5550	371.8457	393.4090 (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	0.6600	10.6334	0.6300	0.7000	0.7700	2.1448 (74)
East	5.6200	19.6403	0.6300	0.7000	0.7700	33.7330 (76)
South	0.7200	46.7521	0.6300	0.7000	0.7700	10.2874 (78)
West	9.1300	19.6403	0.6300	0.7000	0.7700	54.8012 (80)

Solar gains	100.9664	194.1386	313.6485	451.4230	550.1453	562.3279	535.6706	461.8104	362.5182	228.5579	125.2317	83.4835 (83)
Total gains	507.0084	598.6473	703.8371	818.0053	891.6185	880.6010	839.5291	769.8955	683.3198	573.1129	497.0774	476.8925 (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	55.4177	55.5494	55.6791	56.2966	56.4136	56.9650	56.9650	57.0683	56.7513	56.4136	56.1773	55.9324
alpha	4.6945	4.7033	4.7119	4.7531	4.7609	4.7977	4.7977	4.8046	4.7834	4.7609	4.7452	4.7288
util living area	0.9993	0.9983	0.9948	0.9800	0.9307	0.8089	0.6494	0.7154	0.9224	0.9911	0.9986	0.9995 (86)
MIT	19.5032	19.6538	19.9291	20.3057	20.6513	20.8879	20.9705	20.9537	20.7582	20.3017	19.8360	19.4807 (87)
Th 2	19.8777	19.8801	19.8824	19.8933	19.8953	19.9048	19.9048	19.9065	19.9011	19.8953	19.8912	19.8869 (88)
util rest of house	0.9991	0.9977	0.9927	0.9713	0.8980	0.7203	0.5075	0.5772	0.8711	0.9860	0.9980	0.9993 (89)
MIT 2	18.5104	18.6627	18.9389	19.3191	19.6475	19.8495	19.8969	19.8923	19.7539	19.3204	18.8537	18.4952 (90)
Living area fraction									fLA = Living area / (4) =			0.1449 (91)
MIT	18.6543	18.8064	19.0825	19.4621	19.7930	20.0000	20.0525	20.0461	19.8994	19.4626	18.9961	18.6381 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6543	18.8064	19.0825	19.4621	19.7930	20.0000	20.0525	20.0461	19.8994	19.4626	18.9961	18.6381 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9987	0.9968	0.9907	0.9668	0.8942	0.7292	0.5282	0.5969	0.8710	0.9831	0.9972	0.9990 (94)
Ext temp.	506.3253	596.7613	697.2563	790.8450	797.2993	642.1031	443.4024	459.5209	595.1990	563.4534	495.6989	476.4165 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1943.3754	1878.2632	1695.4921	1407.6365	1076.3345	711.2276	454.7264	479.3577	766.7119	1178.6919	1588.7822	1936.7215 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	1069.1653	861.1693	742.6874	444.0898	207.6022	0.0000	0.0000	0.0000	0.0000	457.7375	787.0200	1086.4669 (98)
Space heating per m2										(98) / (4) =		52.3504 (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	1238.0611	974.6438	999.1739	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7914	0.8699	0.8320	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	979.7429	847.8782	831.2869	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1139.1443	1088.7889	1009.5633	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	114.7690	179.2375	132.6376	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												426.6442 (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	28.6922	44.8094	33.1594	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												106.6610 (107)
Space cooling per m2												0.9872 (108)
Energy for space heating												52.3504 (99)
Energy for space cooling												0.9872 (108)
Total												53.3376 (109)
Target Fabric Energy Efficiency (TFEE)												61.3 (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	43.9100 (1b)	x 2.6800 (2b)	= 117.6788 (1b) - (3b)
First floor	64.1300 (1c)	x 2.3200 (2c)	= 148.7816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.4604 (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											4.0200	
Infiltration rate											0.2010 (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) =	0.1709 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2007	0.1879	0.1879	0.1709	0.1751	0.1666	0.1666	0.1623	0.1623	0.1751	0.1709	0.1751 (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			43.9100	0.1200	5.2692	84.0000	3688.4400 (28a)
Above Garage			20.2200	0.1500	3.0330	20.0000	404.4000 (28a)
Brick and Block	140.1100	18.2800	121.8300	0.2400	29.2392	42.2200	5143.6626 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2400	3.0240	42.2200	531.9720 (29a)
Pitched Roof	64.1300		64.1300	0.1000	6.4130	9.1000	583.5830 (30)
Total net area of external elements Aum(A, m ²)			282.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.9809		(33)
Ground Floor Stud			29.9600			9.0000	269.6400 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			147.0500			9.0000	1323.4500 (32c)
Internal Floor 1			43.9100			18.0000	790.3800 (32d)
Internal Ceiling 1			43.9100			18.0000	790.3800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17296.9076 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0973 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.8578 (36)
Total fabric heat loss						(33) + (36) =	89.8386 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660 (38)
Heat transfer coeff	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046 (39)
Average = Sum(39)m / 12 =												133.8046 (39)
HLP	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385 (40)
HLP (average)												1.2385 (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	2.8025 (42)
Average daily hot water use (litres/day)	100.7602 (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	110.8362	106.8058	102.7754	98.7450	94.7146	90.6842	90.6842	94.7146	98.7450	102.7754	106.8058	110.8362	(44)
Energy conte	164.3669	143.7564	148.3437	129.3296	124.0948	107.0844	99.2295	113.8673	115.2272	134.2862	146.5839	159.1806	(45)
Energy content (annual)	Total = Sum (45)m =												1585.3504 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6550	21.5635	22.2516	19.3994	18.6142	16.0627	14.8844	17.0801	17.2841	20.1429	21.9876	23.8771	(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	0.5747	0.5289	0.4370	0.4049	0.4853	0.5120	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(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	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(64)
RHI water heating demand	Total per year (kWh/year) = Sum (64)m =												1592.0841 (64)
Heat gains from water heating, kWh/month	54.8194	47.9512	49.4873	43.1458	41.3938	35.7148	33.0950	37.9822	38.4410	44.7978	48.8944	53.0897	(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	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3710	56.2856	45.7745	34.6543	25.9045	21.8696	23.6309	30.7164	41.2274	52.3477	61.0975	65.1323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	401.0588	405.2205	394.7330	372.4065	344.2233	317.7351	300.0393	295.8776	306.3650	328.6915	356.8747	383.3630	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	(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)	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	(71)
Water heating gains (Table 5)	73.6820	71.3560	66.5152	59.9247	55.6368	49.6039	44.4826	51.0513	53.3903	60.2121	67.9088	71.3571	(72)
Total internal gains	651.7803	646.5305	620.6913	580.6539	539.4330	502.8771	481.8212	491.3137	514.6512	554.9197	599.5495	633.5209	(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				0.6600	13.4684		0.6300		0.7000		0.7700		2.7166 (74)
East				5.6200	25.1733		0.6300		0.7000		0.7700		43.2362 (76)
South				0.7200	56.5862		0.6300		0.7000		0.7700		12.4513 (78)
West				9.1300	25.1733		0.6300		0.7000		0.7700		70.2396 (80)
Solar gains	128.6437	210.5983	345.7978	497.8116	569.1866	642.9888	588.7880	530.8655	417.8260	267.4409	159.0745	100.6611	(83)
Total gains	780.4240	857.1288	966.4890	1078.4655	1108.6197	1145.8659	1070.6092	1022.1793	932.4772	822.3606	758.6240	734.1820	(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	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	
alpha	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	
util living area	0.9766	0.9673	0.9394	0.8727	0.7537	0.5493	0.4002	0.4059	0.6819	0.8904	0.9606	0.9800	(86)
MIT	19.4578	19.6008	19.9487	20.3855	20.7369	20.9371	20.9844	20.9842	20.8652	20.4552	19.8948	19.4230	(87)
Th 2	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	(88)
util rest of house	0.9712	0.9597	0.9248	0.8410	0.6904	0.4466	0.2712	0.2711	0.5839	0.8541	0.9495	0.9752	(89)
MIT 2	18.5185	18.6589	18.9979	19.4108	19.7194	19.8631	19.8862	19.8864	19.8226	19.4856	18.9507	18.4846	(90)
Living area fraction	fLA = Living area / (4) =												0.1449 (91)
MIT	18.6547	18.7954	19.1357	19.5521	19.8669	20.0188	20.0454	20.0455	19.9737	19.6262	19.0875	18.6206	(92)
Temperature adjustment													0.0000
adjusted MIT	18.6547	18.7954	19.1357	19.5521	19.8669	20.0188	20.0454	20.0455	19.9737	19.6262	19.0875	18.6206	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	751.5524	814.1794	881.9120	894.7394	763.7521	526.2598	310.3647	297.1172	552.2205	693.7107	712.3027	710.5467	(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	1746.7756	1712.0885	1543.5266	1264.7298	905.4361	551.1092	313.8263	300.4588	611.9857	1007.0359	1403.2772	1728.8414	(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

	740.4460	603.3949	492.2412	266.3930	105.4129	0.0000	0.0000	0.0000	0.0000	233.1139	497.5016	757.6113 (98)
Space heating												3696.1149 (98)
RHI space heating demand												3696 (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	43.9100 (1b)	x 2.6800 (2b)	= 117.6788 (1b) - (3b)
First floor	64.1300 (1c)	x 2.3200 (2c)	= 148.7816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.4604 (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															4.0200		
Infiltration rate															0.2010 (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) =					0.1709 (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																	
	0.2178	0.2136	0.2093	0.1879	0.1837	0.1623	0.1623	0.1580	0.1709	0.1837	0.1922	0.2007 (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			43.9100	0.1200	5.2692	84.0000	3688.4400 (28a)
Above Garage			20.2200	0.1500	3.0330	20.0000	404.4000 (28a)
Brick and Block	140.1100	18.2800	121.8300	0.2400	29.2392	42.2200	5143.6626 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2400	3.0240	42.2200	531.9720 (29a)
Pitched Roof	64.1300		64.1300	0.1000	6.4130	9.1000	583.5830 (30)
Total net area of external elements Aum(A, m ²)			282.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.9809		(33)
Ground Floor Stud			29.9600			9.0000	269.6400 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			147.0500			9.0000	1323.4500 (32c)
Internal Floor 1			43.9100			18.0000	790.3800 (32d)
Internal Ceiling 1			43.9100			18.0000	790.3800 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17296.9076 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0973 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.8578 (36)
Total fabric heat loss						(33) + (36) =	89.8386 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660 (38)
Heat transfer coeff	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046 (39)
Average = Sum(39)m / 12 =												133.8046 (39)
HLP	Jan 1.2385	Feb 1.2385	Mar 1.2385	Apr 1.2385	May 1.2385	Jun 1.2385	Jul 1.2385	Aug 1.2385	Sep 1.2385	Oct 1.2385	Nov 1.2385	Dec 1.2385 (40)
HLP (average)												1.2385 (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	2.8025 (42)
Average daily hot water use (litres/day)	100.7602 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.8362	106.8058	102.7754	98.7450	94.7146	90.6842	90.6842	94.7146	98.7450	102.7754	106.8058	110.8362	(44)
Energy conte	164.3669	143.7564	148.3437	129.3296	124.0948	107.0844	99.2295	113.8673	115.2272	134.2862	146.5839	159.1806	(45)
Energy content (annual)										Total =	Sum (45)m =	1585.3504	(45)
Distribution loss (46)m = 0.15 x (45)m	24.6550	21.5635	22.2516	19.3994	18.6142	16.0627	14.8844	17.0801	17.2841	20.1429	21.9876	23.8771	(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	0.5747	0.5289	0.4370	0.4049	0.4853	0.5120	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(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	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(64)
Heat gains from water heating, kWh/month	54.8194	47.9512	49.4873	43.1458	41.3938	35.7148	33.0950	37.9822	38.4410	44.7978	48.8944	53.0897	(65)
Total per year (kWh/year) = Sum (64)m = 1592.0841 (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	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3710	56.2856	45.7745	34.6543	25.9045	21.8696	23.6309	30.7164	41.2274	52.3477	61.0975	65.1323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	401.0588	405.2205	394.7330	372.4065	344.2233	317.7351	300.0393	295.8776	306.3650	328.6915	356.8747	383.3630	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	(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)	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	(71)
Water heating gains (Table 5)	73.6820	71.3560	66.5152	59.9247	55.6368	49.6039	44.4826	51.0513	53.3903	60.2121	67.9088	71.3571	(72)
Total internal gains	651.7803	646.5305	620.6913	580.6539	539.4330	502.8771	481.8212	491.3137	514.6512	554.9197	599.5495	633.5209	(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					0.6600	10.6334		0.6300	0.7000	0.7700		2.1448 (74)	
East					5.6200	19.6403		0.6300	0.7000	0.7700		33.7330 (76)	
South					0.7200	46.7521		0.6300	0.7000	0.7700		10.2874 (78)	
West					9.1300	19.6403		0.6300	0.7000	0.7700		54.8012 (80)	

Solar gains	100.9664	194.1386	313.6485	451.4230	550.1453	562.3279	535.6706	461.8104	362.5182	228.5579	125.2317	83.4835 (83)	
Total gains	752.7467	840.6691	934.3397	1032.0769	1089.5783	1065.2049	1017.4918	953.1241	877.1694	783.4776	724.7812	717.0043 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	
alpha	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	
util living area	0.9833	0.9746	0.9548	0.9087	0.8208	0.6821	0.5368	0.5850	0.7918	0.9324	0.9747	0.9858	(86)
MIT	19.2250	19.4143	19.7551	20.1909	20.5842	20.8458	20.9494	20.9312	20.7283	20.2148	19.6299	19.1695	(87)
Th 2	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	(88)
util rest of house	0.9797	0.9690	0.9443	0.8863	0.7746	0.5977	0.4179	0.4667	0.7223	0.9111	0.9680	0.9827	(89)
MIT 2	18.2876	18.4746	18.8093	19.2293	19.5903	19.8049	19.8716	19.8631	19.7217	19.2608	18.6901	18.2327	(90)
Living area fraction	18.4235	18.6108	18.9464	19.3687	19.7343	19.9558	20.0279	20.0179	19.8676	19.3991	18.8263	18.3685	(92)
MIT	18.4235	18.6108	18.9464	19.3687	19.7343	19.9558	20.0279	20.0179	19.8676	19.3991	18.8263	18.3685	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4235	18.6108	18.9464	19.3687	19.7343	19.9558	20.0279	20.0179	19.8676	19.3991	18.8263	18.3685	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9731	0.9604	0.9330	0.8736	0.7672	0.6032	0.4337	0.4815	0.7207	0.8992	0.9595	0.9767	(94)
Useful gains	732.4729	807.3624	871.7173	901.6614	835.9158	642.5629	441.2798	458.9089	632.1548	704.4947	695.4392	700.3270	(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	1889.7864	1834.5666	1665.3846	1400.7614	1075.0300	716.6274	458.6632	484.0942	771.7364	1177.3621	1569.0327	1895.8049	(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	861.0412	690.2812	590.4885	359.3520	177.9009	0.0000	0.0000	0.0000	0.0000	351.8134	628.9873	889.4356	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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Space heating
Space heating per m2

(98) / (4) = 4549.3001 (98)
42.1076 (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													5043.5699 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	861.0412	690.2812	590.4885	359.3520	177.9009	0.0000	0.0000	0.0000	0.0000	351.8134	628.9873	889.4356	(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)	954.5911	765.2785	654.6436	398.3947	197.2294	0.0000	0.0000	0.0000	0.0000	390.0370	697.3251	986.0705	(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	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(64)
Efficiency of water heater	87.6534	87.4673	87.0325	86.0720	83.9531	76.4000	76.4000	76.4000	76.4000	85.9000	87.2124	87.7847	(216)
(217)m	87.6534	87.4673	87.0325	86.0720	83.9531	76.4000	76.4000	76.4000	76.4000	85.9000	87.2124	87.7847	(217)
Fuel for water heating, kWh/month	188.2831	165.0506	171.1957	150.9251	148.4445	140.7348	130.4115	149.6761	151.4911	157.0158	168.7887	182.0696	(219)
Water heating fuel used												1904.0866	(219)
Annual totals kWh/year													
Space heating fuel - main system												5043.5699	(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)												77.3694	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												152.3694	(231)
Electricity for lighting (calculated in Appendix L)												447.6609	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.23 * 908 * 1.00) =										-893.3286		-893.3286	(233)
Total delivered energy for all uses												6654.3583	(238)

10a. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost	
	kWh/year	p/kWh	£/year	
Space heating - main system 1	5043.5699	3.4800	175.5162	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1904.0866	3.4800	66.2622	(247)
Mechanical ventilation fans	77.3694	13.1900	10.2050	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	447.6609	13.1900	59.0465	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-893.3286	13.1900	-117.8300	(252)
Total energy cost			323.0924	(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] =		0.8867	(257)
SAP value			87.6307	
SAP rating (Section 12)			88	(258)
SAP band			B	

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	5043.5699	0.2160	1089.4111	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1904.0866	0.2160	411.2827	(264)
Space and water heating			1500.6938	(265)
Pumps and fans	152.3694	0.5190	79.0797	(267)
Energy for lighting	447.6609	0.5190	232.3360	(268)
Energy saving/generation technologies				
PV Unit	-893.3286	0.5190	-463.6375	(269)
Total kg/year			1348.4720	(272)

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CO2 emissions per m2	12.4800 (273)
EI value	88.1929
EI rating	88 (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	$3.48 / 0.8322 = 4.182$, stars = 4
Water heating environmental impact	$0.216 / 0.8322 = 0.2595$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.9100 (1b)	x 2.6800 (2b)	= 117.6788 (1b) - (3b)
First floor	64.1300 (1c)	x 2.3200 (2c)	= 148.7816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.4604 (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											4.0200	
Infiltration rate											0.2010 (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) =	0.1709 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2007	0.1879	0.1879	0.1709	0.1751	0.1666	0.1666	0.1623	0.1623	0.1751	0.1709	0.1751 (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			43.9100	0.1200	5.2692	84.0000	3688.4400 (28a)
Above Garage			20.2200	0.1500	3.0330	20.0000	404.4000 (28a)
Brick and Block	140.1100	18.2800	121.8300	0.2400	29.2392	42.2200	5143.6626 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2400	3.0240	42.2200	531.9720 (29a)
Pitched Roof	64.1300		64.1300	0.1000	6.4130	9.1000	583.5830 (30)
Total net area of external elements Aum(A, m ²)			282.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.9809		(33)
Ground Floor Stud			29.9600			9.0000	269.6400 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			147.0500			9.0000	1323.4500 (32c)
Internal Floor 1			43.9100			18.0000	790.3800 (32d)
Internal Ceiling 1			43.9100			18.0000	790.3800 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17296.9076 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0973 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.8578 (36)
Total fabric heat loss						(33) + (36) =	89.8386 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660 (38)
Heat transfer coeff	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046 (39)
Average = Sum(39)m / 12 =												133.8046 (39)
HLP	Jan 1.2385	Feb 1.2385	Mar 1.2385	Apr 1.2385	May 1.2385	Jun 1.2385	Jul 1.2385	Aug 1.2385	Sep 1.2385	Oct 1.2385	Nov 1.2385	Dec 1.2385 (40)
HLP (average)												1.2385 (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	2.8025 (42)
Average daily hot water use (litres/day)	100.7602 (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	110.8362	106.8058	102.7754	98.7450	94.7146	90.6842	90.6842	94.7146	98.7450	102.7754	106.8058	110.8362	(44)
Energy conte	164.3669	143.7564	148.3437	129.3296	124.0948	107.0844	99.2295	113.8673	115.2272	134.2862	146.5839	159.1806	(45)
Energy content (annual)										Total =	Sum (45)m =	1585.3504	(45)
Distribution loss (46)m = 0.15 x (45)m	24.6550	21.5635	22.2516	19.3994	18.6142	16.0627	14.8844	17.0801	17.2841	20.1429	21.9876	23.8771	(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	0.5747	0.5289	0.4370	0.4049	0.4853	0.5120	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(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	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(64)
Heat gains from water heating, kWh/month	54.8194	47.9512	49.4873	43.1458	41.3938	35.7148	33.0950	37.9822	38.4410	44.7978	48.8944	53.0897	(65)
Total per year (kWh/year) = Sum (64)m = 1592.0841 (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	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3710	56.2856	45.7745	34.6543	25.9045	21.8696	23.6309	30.7164	41.2274	52.3477	61.0975	65.1323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	401.0588	405.2205	394.7330	372.4065	344.2233	317.7351	300.0393	295.8776	306.3650	328.6915	356.8747	383.3630	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	(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)	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	(71)
Water heating gains (Table 5)	73.6820	71.3560	66.5152	59.9247	55.6368	49.6039	44.4826	51.0513	53.3903	60.2121	67.9088	71.3571	(72)
Total internal gains	651.7803	646.5305	620.6913	580.6539	539.4330	502.8771	481.8212	491.3137	514.6512	554.9197	599.5495	633.5209	(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					0.6600	13.4684	0.6300	0.7000			0.7700			2.7166 (74)
East					5.6200	25.1733	0.6300	0.7000			0.7700			43.2362 (76)
South					0.7200	56.5862	0.6300	0.7000			0.7700			12.4513 (78)
West					9.1300	25.1733	0.6300	0.7000			0.7700			70.2396 (80)
Solar gains	128.6437	210.5983	345.7978	497.8116	569.1866	642.9888	588.7880	530.8655	417.8260	267.4409	159.0745			100.6611 (83)
Total gains	780.4240	857.1288	966.4890	1078.4655	1108.6197	1145.8659	1070.6092	1022.1793	932.4772	822.3606	758.6240			734.1820 (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	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083
alpha	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939
util living area	0.9766	0.9673	0.9394	0.8727	0.7537	0.5493	0.4002	0.4059	0.6819	0.8904	0.9606	0.9800 (86)
MIT	19.4578	19.6008	19.9487	20.3855	20.7369	20.9371	20.9844	20.9842	20.8652	20.4552	19.8948	19.4230 (87)
Th 2	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893 (88)
util rest of house	0.9712	0.9597	0.9248	0.8410	0.6904	0.4466	0.2712	0.2711	0.5839	0.8541	0.9495	0.9752 (89)
MIT 2	18.5185	18.6589	18.9979	19.4108	19.7194	19.8631	19.8862	19.8864	19.8226	19.4856	18.9507	18.4846 (90)
Living area fraction									fLA = Living area / (4) =			0.1449 (91)
MIT	18.6547	18.7954	19.1357	19.5521	19.8669	20.0188	20.0454	20.0455	19.9737	19.6262	19.0875	18.6206 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6547	18.7954	19.1357	19.5521	19.8669	20.0188	20.0454	20.0455	19.9737	19.6262	19.0875	18.6206 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9630	0.9499	0.9125	0.8296	0.6889	0.4593	0.2899	0.2907	0.5922	0.8436	0.9389	0.9678	(94)
Useful gains	751.5524	814.1794	881.9120	894.7394	763.7521	526.2598	310.3647	297.1172	552.2205	693.7107	712.3027	710.5467	(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	1746.7756	1712.0885	1543.5266	1264.7298	905.4361	551.1092	313.8263	300.4588	611.9857	1007.0359	1403.2772	1728.8414	(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	740.4460	603.3949	492.2412	266.3930	105.4129	0.0000	0.0000	0.0000	0.0000	233.1139	497.5016	757.6113	(98)

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Space heating 3696.1149 (98)
Space heating per m2 (98) / (4) = 34.2106 (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													4097.6884 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	740.4460	603.3949	492.2412	266.3930	105.4129	0.0000	0.0000	0.0000	0.0000	233.1139	497.5016	757.6113	(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)	820.8936	668.9522	545.7220	295.3360	116.8658	0.0000	0.0000	0.0000	0.0000	258.4412	551.5539	839.9238	(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	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(64)
Efficiency of water heater (217)m	87.3251	87.1605	86.5668	85.1579	82.1601	76.4000	76.4000	76.4000	76.4000	84.5992	86.6273	87.4482	(216)
Fuel for water heating, kWh/month	188.9911	165.6316	172.1168	152.5452	151.6840	140.7348	130.4115	149.6761	151.4911	159.4302	169.9289	182.7701	(219)
Water heating fuel used												1915.4115	(219)
Annual totals kWh/year													
Space heating fuel - main system												4097.6884	(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)													77.3694 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													152.3694 (231)
Electricity for lighting (calculated in Appendix L)													447.6609 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.23 * 1030 * 1.00) =										-1013.5784		-1013.5784	(233)
Total delivered energy for all uses													5599.5518 (238)

10a. Fuel costs - using BEDF prices (556)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4097.6884	5.9600	244.2222 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1915.4115	5.9600	114.1585 (247)
Mechanical ventilation fans	77.3694	25.0500	19.3810 (249)
Pumps and fans for heating	75.0000	25.0500	18.7875 (249)
Energy for lighting	447.6609	25.0500	112.1391 (250)
Additional standing charges			112.0000 (251)
Energy saving/generation technologies			
PV Unit	-1013.5784	25.0500	-253.9014 (252)
Total energy cost			366.7870 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4097.6884	0.2160	885.1007 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1915.4115	0.2160	413.7289 (264)
Space and water heating			1298.8296 (265)
Pumps and fans	152.3694	0.5190	79.0797 (267)
Energy for lighting	447.6609	0.5190	232.3360 (268)
Energy saving/generation technologies			
PV Unit	-1013.5784	0.5190	-526.0472 (269)
Total kg/year			1084.1981 (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	4097.6884	1.2200	4999.1798 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1915.4115	1.2200	2336.8021 (264)

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Space and water heating			7335.9819 (265)
Pumps and fans	152.3694	3.0700	467.7742 (267)
Energy for lighting	447.6609	3.0700	1374.3191 (268)
Energy saving/generation technologies			
PV Unit	-1013.5784	3.0700	-3111.6858 (269)
Primary energy kWh/year			6066.3893 (272)
Primary energy kWh/m2/year			56.1495 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 52	-209 kg (19.3%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£52 1.94 kg/m²	B 89	B 90
Total Savings	£52 1.94 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 556 TEST (29 Nov 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	£150	£163	-£13
Mains gas	£470	£405	£65
Space heating	£394	£394	£0
Water heating	£114	£62	£52
Lighting	£112	£112	£0
Generated (PV)	-£254	-£254	£0
Total cost of fuels	£366	£314	£52
Total cost of uses	£366	£314	£52
Delivered energy	52 kWh/m²	42 kWh/m²	10 kWh/m²
Carbon dioxide emissions	1.1 tonnes	0.9 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	8 kg/m²	2 kg/m²
Primary energy	56 kWh/m²	45 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	43.9100 (1b)	x 2.6800 (2b)	= 117.6788 (1b) - (3b)
First floor	64.1300 (1c)	x 2.3200 (2c)	= 148.7816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.4604 (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															4.0200						
Infiltration rate															0.2010 (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) =					0.1709 (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	0.2178	0.2136	0.2093	0.1879	0.1837	0.1623	0.1623	0.1580	0.1709	0.1837	0.1922	0.2007 (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			43.9100	0.1200	5.2692	84.0000	3688.4400 (28a)
Above Garage			20.2200	0.1500	3.0330	20.0000	404.4000 (28a)
Brick and Block	140.1100	18.2800	121.8300	0.2400	29.2392	42.2200	5143.6626 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2400	3.0240	42.2200	531.9720 (29a)
Pitched Roof	64.1300		64.1300	0.1000	6.4130	9.1000	583.5830 (30)
Total net area of external elements Aum(A, m ²)			282.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.9809		(33)
Ground Floor Stud			29.9600			9.0000	269.6400 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			147.0500			9.0000	1323.4500 (32c)
Internal Floor 1			43.9100			18.0000	790.3800 (32d)
Internal Ceiling 1			43.9100			18.0000	790.3800 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17296.9076 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0973 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.8578 (36)
Total fabric heat loss						(33) + (36) =	89.8386 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660	43.9660 (38)
Heat transfer coeff	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046 (39)
Average = Sum(39)m / 12 =												133.8046 (39)
HLP	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385	1.2385 (40)
HLP (average)												1.2385 (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	2.8025 (42)
Average daily hot water use (litres/day)	100.7602 (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	110.8362	106.8058	102.7754	98.7450	94.7146	90.6842	90.6842	94.7146	98.7450	102.7754	106.8058	110.8362	(44)
Energy conte	164.3669	143.7564	148.3437	129.3296	124.0948	107.0844	99.2295	113.8673	115.2272	134.2862	146.5839	159.1806	(45)
Energy content (annual)	Total = Sum (45)m =												1585.3504 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6550	21.5635	22.2516	19.3994	18.6142	16.0627	14.8844	17.0801	17.2841	20.1429	21.9876	23.8771	(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	0.5747	0.5289	0.4370	0.4049	0.4853	0.5120	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(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													1.1440 (H8)
Utilisation factor													0.5828 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													75.0000 (H13)
Daily hot water demand													100.7602 (H14)
Volume ratio Veff/V													0.7443 (H15)
Solar storage volume factor													0.9409 (H16)
Solar input													-874.4750 (H17)
Solar input	-25.3580	-42.3153	-72.0677	-96.5850	-119.3226	-117.3131	-115.7628	-101.1425	-79.2149	-54.0944	-30.0783	-21.2203	(63)
Solar input (sum of months) = Sum (63)m =													-874.4750 (63)
Output from w/h	139.6786	102.0500	76.9282	33.3193	5.3012	0.0000	0.0000	13.2101	36.5243	80.7822	117.1265	138.6088	(64)
Total per year (kWh/year) = Sum (64)m =													743.5292 (64)
Heat gains from water heating, kWh/month	54.8194	47.9512	49.4873	43.1458	41.3938	35.7148	33.0950	37.9822	38.4410	44.7978	48.8944	53.0897	(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	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3710	56.2856	45.7745	34.6543	25.9045	21.8696	23.6309	30.7164	41.2274	52.3477	61.0975	65.1323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	401.0588	405.2205	394.7330	372.4065	344.2233	317.7351	300.0393	295.8776	306.3650	328.6915	356.8747	383.3630	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	(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)	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	(71)
Water heating gains (Table 5)	73.6820	71.3560	66.5152	59.9247	55.6368	49.6039	44.4826	51.0513	53.3903	60.2121	67.9088	71.3571	(72)
Total internal gains	651.7803	646.5305	620.6913	580.6539	539.4330	502.8771	481.8212	491.3137	514.6512	554.9197	599.5495	633.5209	(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					0.6600	10.6334		0.6300	0.7000	0.7700		2.1448 (74)	
East					5.6200	19.6403		0.6300	0.7000	0.7700		33.7330 (76)	
South					0.7200	46.7521		0.6300	0.7000	0.7700		10.2874 (78)	
West					9.1300	19.6403		0.6300	0.7000	0.7700		54.8012 (80)	

Solar gains	100.9664	194.1386	313.6485	451.4230	550.1453	562.3279	535.6706	461.8104	362.5182	228.5579	125.2317	83.4835	(83)
Total gains	752.7467	840.6691	934.3397	1032.0769	1089.5783	1065.2049	1017.4918	953.1241	877.1694	783.4776	724.7812	717.0043	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	
alpha	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	
util living area	0.9833	0.9746	0.9548	0.9087	0.8208	0.6821	0.5368	0.5850	0.7918	0.9324	0.9747	0.9858	(86)
MIT	19.2250	19.4143	19.7551	20.1909	20.5842	20.8458	20.9494	20.9312	20.7283	20.2148	19.6299	19.1695	(87)
Th 2	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	(88)
util rest of house	0.9797	0.9690	0.9443	0.8863	0.7746	0.5977	0.4179	0.4667	0.7223	0.9111	0.9680	0.9827	(89)
MIT 2	18.2876	18.4746	18.8093	19.2293	19.5903	19.8049	19.8716	19.8631	19.7217	19.2608	18.6901	18.2327	(90)
Living area fraction	fLA = Living area / (4) =												0.1449 (91)

MIT	18.4235	18.6108	18.9464	19.3687	19.7343	19.9558	20.0279	20.0179	19.8676	19.3991	18.8263	18.3685 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4235	18.6108	18.9464	19.3687	19.7343	19.9558	20.0279	20.0179	19.8676	19.3991	18.8263	18.3685 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP value 88.7777
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	5043.5699	0.2160	1089.4111 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	853.6252	0.2160	184.3830 (264)
Space and water heating			1273.7942 (265)
Pumps and fans	202.3694	0.5190	105.0297 (267)
Energy for lighting	447.6609	0.5190	232.3360 (268)
Energy saving/generation technologies			
PV Unit	-893.3286	0.5190	-463.6375 (269)
Total kg/year			1147.5224 (272)
CO2 emissions per m2			10.6200 (273)
EI value			89.9524
EI rating			90 (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	43.9100 (1b)	x 2.6800 (2b)	= 117.6788 (1b) - (3b)
First floor	64.1300 (1c)	x 2.3200 (2c)	= 148.7816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 266.4604 (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											4.0200	
Infiltration rate											0.2010 (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) =	0.1709 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2007	0.1879	0.1879	0.1709	0.1751	0.1666	0.1666	0.1623	0.1623	0.1751	0.1709	0.1751 (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			43.9100	0.1200	5.2692	84.0000	3688.4400 (28a)
Above Garage			20.2200	0.1500	3.0330	20.0000	404.4000 (28a)
Brick and Block	140.1100	18.2800	121.8300	0.2400	29.2392	42.2200	5143.6626 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2400	3.0240	42.2200	531.9720 (29a)
Pitched Roof	64.1300		64.1300	0.1000	6.4130	9.1000	583.5830 (30)
Total net area of external elements Aum(A, m ²)			282.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.9809		(33)
Ground Floor Stud			29.9600			9.0000	269.6400 (32c)
Ground Floor Block			50.2800			75.0000	3771.0000 (32c)
First Floor Stud			147.0500			9.0000	1323.4500 (32c)
Internal Floor 1			43.9100			18.0000	790.3800 (32d)
Internal Ceiling 1			43.9100			18.0000	790.3800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17296.9076 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0973 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.8578 (36)
Total fabric heat loss						(33) + (36) =	89.8386 (37)

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

(38)m	Jan 43.9660	Feb 43.9660	Mar 43.9660	Apr 43.9660	May 43.9660	Jun 43.9660	Jul 43.9660	Aug 43.9660	Sep 43.9660	Oct 43.9660	Nov 43.9660	Dec 43.9660 (38)
Heat transfer coeff	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046	133.8046 (39)
Average = Sum(39)m / 12 =												133.8046 (39)
HLP	Jan 1.2385	Feb 1.2385	Mar 1.2385	Apr 1.2385	May 1.2385	Jun 1.2385	Jul 1.2385	Aug 1.2385	Sep 1.2385	Oct 1.2385	Nov 1.2385	Dec 1.2385 (40)
HLP (average)												1.2385 (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	2.8025 (42)
Average daily hot water use (litres/day)	100.7602 (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	110.8362	106.8058	102.7754	98.7450	94.7146	90.6842	90.6842	94.7146	98.7450	102.7754	106.8058	110.8362	(44)
Energy conte	164.3669	143.7564	148.3437	129.3296	124.0948	107.0844	99.2295	113.8673	115.2272	134.2862	146.5839	159.1806	(45)
Energy content (annual)	Total = Sum (45)m =												1585.3504 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6550	21.5635	22.2516	19.3994	18.6142	16.0627	14.8844	17.0801	17.2841	20.1429	21.9876	23.8771	(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	0.5747	0.5289	0.4370	0.4049	0.4853	0.5120	0.5905	0.6209	0.6486	(61)
Total heat required for water heating calculated for each month	165.0366	144.3653	148.9960	129.9043	124.6238	107.5214	99.6344	114.3526	115.7392	134.8766	147.2048	159.8292	(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													1.2780 (H8)
Utilisation factor													0.5427 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													75.0000 (H13)
Daily hot water demand													100.7602 (H14)
Volume ratio Veff/V													0.7443 (H15)
Solar storage volume factor													0.9409 (H16)
Solar input													-909.7836 (H17)
Solar input	-29.6874	-42.2188	-73.2605	-98.5478	-114.5191	-124.5636	-118.1053	-107.7006	-84.2970	-58.2631	-35.1134	-23.5069	(63)
Solar input (sum of months) = Sum (63)m =													-909.7836 (63)
Output from w/h	135.3492	102.1465	75.7354	31.3565	10.1046	0.0000	0.0000	6.6520	31.4422	76.6136	112.0913	136.3222	(64)
Total per year (kWh/year) = Sum (64)m =													717.8136 (64)
Heat gains from water heating, kWh/month	54.8194	47.9512	49.4873	43.1458	41.3938	35.7148	33.0950	37.9822	38.4410	44.7978	48.8944	53.0897	(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	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	168.1521	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3710	56.2856	45.7745	34.6543	25.9045	21.8696	23.6309	30.7164	41.2274	52.3477	61.0975	65.1323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	401.0588	405.2205	394.7330	372.4065	344.2233	317.7351	300.0393	295.8776	306.3650	328.6915	356.8747	383.3630	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	54.6177	(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)	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	-112.1014	(71)
Water heating gains (Table 5)	73.6820	71.3560	66.5152	59.9247	55.6368	49.6039	44.4826	51.0513	53.3903	60.2121	67.9088	71.3571	(72)
Total internal gains	651.7803	646.5305	620.6913	580.6539	539.4330	502.8771	481.8212	491.3137	514.6512	554.9197	599.5495	633.5209	(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				0.6600	13.4684		0.6300		0.7000		0.7700		2.7166 (74)
East				5.6200	25.1733		0.6300		0.7000		0.7700		43.2362 (76)
South				0.7200	56.5862		0.6300		0.7000		0.7700		12.4513 (78)
West				9.1300	25.1733		0.6300		0.7000		0.7700		70.2396 (80)

Solar gains	128.6437	210.5983	345.7978	497.8116	569.1866	642.9888	588.7880	530.8655	417.8260	267.4409	159.0745	100.6611	(83)
Total gains	780.4240	857.1288	966.4890	1078.4655	1108.6197	1145.8659	1070.6092	1022.1793	932.4772	822.3606	758.6240	734.1820	(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	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	35.9083	
alpha	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	3.3939	
util living area	0.9766	0.9673	0.9394	0.8727	0.7537	0.5493	0.4002	0.4059	0.6819	0.8904	0.9606	0.9800	(86)
MIT	19.4578	19.6008	19.9487	20.3855	20.7369	20.9371	20.9844	20.9842	20.8652	20.4552	19.8948	19.4230	(87)
Th 2	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	19.8893	(88)
util rest of house	0.9712	0.9597	0.9248	0.8410	0.6904	0.4466	0.2712	0.2711	0.5839	0.8541	0.9495	0.9752	(89)
MIT 2	18.5185	18.6589	18.9979	19.4108	19.7194	19.8631	19.8862	19.8864	19.8226	19.4856	18.9507	18.4846	(90)
Living area fraction	fLA = Living area / (4) =												0.1449 (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	4097.6884	0.2160	885.1007 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	825.5270	0.2160	178.3138 (264)
Space and water heating			1063.4145 (265)
Pumps and fans	202.3694	0.5190	105.0297 (267)
Energy for lighting	447.6609	0.5190	232.3360 (268)
Energy saving/generation technologies			
PV Unit	-1013.5784	0.5190	-526.0472 (269)
Total kg/year			874.7331 (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	4097.6884	1.2200	4999.1798 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	825.5270	1.2200	1007.1429 (264)
Space and water heating			6006.3227 (265)
Pumps and fans	202.3694	3.0700	621.2742 (267)
Energy for lighting	447.6609	3.0700	1374.3191 (268)
Energy saving/generation technologies			
PV Unit	-1013.5784	3.0700	-3111.6858 (269)
Primary energy kWh/year			4890.2302 (272)
Primary energy kWh/m2/year			45.2631 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 15	Issued on Date	07/01/2025
Assessment Reference	As Built	Prop Type Ref	Type A
Project	31 , Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	14.21	TER	18.69
Environmental	88 B	% DER<TER	23.96		
CO ₂ Emissions (t/year)	1.08	DFEE	54.16	TFEE	61.34
General Requirements Compliance	Pass	% DFEE<TFEE	11.71		

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 15	Issued on Date	07/01/2025
Assessment Reference	As Built	Prop Type Ref	Type A
Project	31 , Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	14.21	TER	18.69
Environmental	88 B	% DER<TER	23.96		
CO ₂ Emissions (t/year)	1.08	DFEE	54.16	TFEE	61.34
General Requirements Compliance	Pass	% DFEE<TFEE	11.71		

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 15	Issued on Date	07/01/2025
Assessment Reference	As Built	Prop Type Ref	Type A
Project	31 , Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	14.21	TER	18.69
Environmental	88 B	% DER<TER	23.96		
CO ₂ Emissions (t/year)	1.08	DFEE	54.16	TFEE	61.34
General Requirements Compliance	Pass	% DFEE<TFEE	11.71		

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 15	Issued on Date	07/01/2025
Assessment Reference	As Built	Prop Type Ref	Type A
Project	31 , Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	14.21	TER	18.69
Environmental	88 B	% DER<TER	23.96		
CO ₂ Emissions (t/year)	1.08	DFEE	54.16	TFEE	61.34
General Requirements Compliance	Pass	% DFEE<TFEE	11.71		

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 15	Issued on Date	07/01/2025
Assessment Reference	As Built	Prop Type Ref	Type A
Project	31 , Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	14.21	TER	18.69
Environmental	88 B	% DER<TER	23.96		
CO ₂ Emissions (t/year)	1.08	DFEE	54.16	TFEE	61.34
General Requirements Compliance	Pass	% DFEE<TFEE	11.71		

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 15	Issued on Date	07/01/2025
Assessment Reference	As Built	Prop Type Ref	Type A
Property	31 , Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	14.21
Environmental	88 B	TER	18.69
CO ₂ Emissions (t/year)	1.08	% DER<TER	23.96
General Requirements Compliance	Pass	DFEE	54.16
		TFEE	61.34
		% DFEE<TFEE	11.71
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	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	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:	27.80 m	43.91 m ²
	1st Storey:	34.47 m	64.13 m ²
			2.68 m
			2.32 m

7.0 Living Area	15.66	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	160.1	kJ/m²K

9.0 External Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
Brick and Block	Cavity Wall	Other		0.24	42.22	140.11	121.83
Wall to Garage	Cavity Wall	Other		0.24	42.22	14.36	12.60

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

9.2 Internal Walls				Kappa (kJ/m ² K)	Area (m ²)
Description	Construction				
Ground Floor Stud	Plasterboard on timber frame			9.00	29.96
Ground Floor Block	Dense block, plasterboard on dabs			75.00	50.28
First Floor Stud	Plasterboard on timber frame			9.00	147.05

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	64.13	64.13

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	43.91

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	43.91
Above Garage	Ground Floor - Timber	Suspended timber, insulation between joists	0.15	20.00	20.22

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.91

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	East							2.15	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					5.62	
Side Elevation	Window	[1] Brick and Block	South	None	0.00					0.72	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					9.13	
Side Elevation	Window	[1] Brick and Block	North	None	0.00					0.66	
Personnel Door	Solid Door	[2] Wall to Garage	South							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)	11.23	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	11.92	0.021	No	Knauf P5
Independently assessed	E4 Jamb	34.05	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	27.80	0.320	No	
Table K1 - Default	E20 Exposed floor (normal)	12.76	0.320	No	
Table K1 - Default	E21 Exposed floor (inverted)	6.00	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	21.71	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	16.90	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	10.92	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	22.32	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

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
1.23	West	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	£52	B 89	