



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 25, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 06/08/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 12			Issued on Date	06/08/2024
Assessment Reference	As Built	Prop Type Ref	Type A		
Property	25, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	14.53	TER	18.73
Environmental	88 B	% DER<TER	22.43		
CO ₂ Emissions (t/year)	1.10	DFEE	54.03	TFEE	61.58
General Requirements Compliance	Pass	% DFEE<TFEE	12.26		
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)	18.73	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.53	kgCO ₂ /m ²	Pass
	-4.20 (-22.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.58	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	54.03	kWh/m ² /yr	
	-7.6 (-12.3%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.13 (max. 0.25)	0.14 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.24 (max. 2.00)	1.80 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.95 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
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, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

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

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Air permeability	4.0	m ³ /m ² h
Photovoltaic array	1.20	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 12	Issued on Date	06/08/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Property	25, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	14.53
Environmental	88 B	TER	18.73
CO ₂ Emissions (t/year)	1.10	% DER<TER	22.43
General Requirements Compliance	Pass	DFEE	54.03
		TFEE	61.58
		% DFEE<TFEE	12.26
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	27.81	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	21.78	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	23.57	1.41	
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: **19.26** W/mK:
Y-Value: **0.068** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 12			Issued on Date	06/08/2024
Assessment Reference	As Built	Prop Type Ref	Type A		
Property	25, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	14.53	TER	18.73
Environmental	88 B	% DER<TER	22.43		
CO ₂ Emissions (t/year)	1.10	DFEE	54.03	TFEE	61.58
General Requirements Compliance	Pass	% DFEE<TFEE	12.26		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

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

DWELLING AS BUILT

Detached House, total floor area 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) 18.73 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.53 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)54.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.24 (max. 2.00)	1.80 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Data from database

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, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:

Average

Windows facing North: 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/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
Air permeability	4.0 m ³ /m ² h
Photovoltaic array	1.20 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.9100 (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					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					3.9500
Infiltration rate					0.3476 (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) =	0.2955 (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	0.3767	0.3693	0.3620	0.3250	0.3176	0.2807	0.2807	0.2733	0.2955	0.3176	0.3324	0.3472 (22b)
Effective ac	0.5710	0.5682	0.5655	0.5528	0.5504	0.5394	0.5394	0.5374	0.5437	0.5504	0.5552	0.5603 (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	0.1388	2.8057	20.0000	404.4000 (28a)
Brick and Block	140.1400	18.2800	121.8600	0.2400	29.2464	42.2200	5144.9292 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2125	2.6771	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)			282.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.4139		(33)
Ground Floor Stud			29.9100			9.0000	269.1900 (32c)
Ground Floor Block			50.2200			75.0000	3766.5000 (32c)
First Floor Stud			146.4800			9.0000	1318.3200 (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) =		17288.0942 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0157 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.2612 (36)
Total fabric heat loss						(33) + (36) =	89.6750 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	50.2058	49.9635	49.7260	48.6105	48.4018	47.4302	47.4302	47.2502	47.8044	48.4018	48.8240	49.2654 (38)
Average = Sum(39)m / 12 =	139.8808	139.6385	139.4010	138.2855	138.0768	137.1052	137.1052	136.9252	137.4794	138.0768	138.4990	138.9404 (39)
												138.2845 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2947	1.2925	1.2903	1.2799	1.2780	1.2690	1.2690	1.2674	1.2725	1.2780	1.2819	1.2860 (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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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)
	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												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	34.3310	34.3906	34.4492	34.7271	34.7796	35.0260	35.0260	35.0720	34.9307	34.7796	34.6735	34.5634
util living area	3.2887	3.2927	3.2966	3.3151	3.3186	3.3351	3.3351	3.3381	3.3287	3.3186	3.3116	3.3042
MIT	0.9939	0.9892	0.9774	0.9461	0.8786	0.7588	0.6204	0.6753	0.8675	0.9674	0.9901	0.9950 (86)
Th 2	18.8877	19.0919	19.4669	19.9699	20.4348	20.7720	20.9168	20.9874	20.6036	19.9910	19.3477	18.8499 (87)
util rest of house	19.8450	19.8467	19.8485	19.8566	19.8581	19.8652	19.8652	19.8665	19.8624	19.8581	19.8550	19.8518 (88)
MIT 2	0.9924	0.9866	0.9716	0.9310	0.8412	0.6777	0.4911	0.5509	0.8113	0.9556	0.9873	0.9938 (89)
Living area fraction	17.9211	18.1255	18.4987	18.9974	19.4381	19.7345	19.8346	19.8209	19.6036	19.0263	18.3874	17.8883 (90)
MIT	18.0612	18.2656	18.6391	19.1384	19.5826	19.8849	19.9914	19.9754	19.7486	19.1661	18.5266	18.0277 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0612	18.2656	18.6391	19.1384	19.5826	19.8849	19.9914	19.9754	19.7486	19.1661	18.5266	18.0277 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9891	0.9815	0.9633	0.9189	0.8302	0.6793	0.5070	0.5644	0.8043	0.9457	0.9826	0.9910 (94)
Ext temp.	530.9161	615.9272	704.1621	774.3785	759.5073	612.4995	435.3449	446.6530	567.6103	565.5231	515.5814	501.2401 (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	1924.9322	1866.3514	1692.1978	1415.8217	1088.4000	724.5810	464.9837	489.5685	776.5609	1182.7827	1582.5727	1921.2237 (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	1037.1480	840.2851	735.0986	461.8391	244.6962	0.0000	0.0000	0.0000	0.0000	459.2412	768.2337	1056.4678 (98)
Space heating per m2												5603.0096 (98)
										(98) / (4) =		51.8605 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6211.7623 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1037.1480	840.2851	735.0986	461.8391	244.6962	0.0000	0.0000	0.0000	0.0000	459.2412	768.2337	1056.4678	(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)	1149.8315	931.5799	814.9651	512.0167	271.2818	0.0000	0.0000	0.0000	0.0000	509.1365	851.7004	1171.2503	(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	88.0175	87.8729	87.5353	86.7597	85.0180	76.4000	76.4000	76.4000	76.4000	86.6469	87.6540	76.4000	(216)
Fuel for water heating, kWh/month	187.5045	164.2888	170.2124	149.7288	146.5851	140.7348	130.4115	149.6761	151.4911	155.6623	167.9383	181.4000	(219)
Water heating fuel used												1895.6338	(219)
Annual totals kWh/year													
Space heating fuel - main system												6211.7623	(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)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 908 * 1.00) =													-871.5401
Total delivered energy for all uses													-871.5401 (233)
													7758.5170 (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	6211.7623	0.2160	1341.7407 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1895.6338	0.2160	409.4569 (264)
Space and water heating			1751.1976 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	447.6609	0.5190	232.3360 (268)
Energy saving/generation technologies			
PV Unit	-871.5401	0.5190	-452.3293 (269)
Total CO2, kg/year			1570.1293 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5300 (273)

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

DER			14.5300 ZC1
Total Floor Area		TFA	108.0400
Assumed number of occupants		N	2.8025
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			14.7382 ZC2
CO2 emissions from cooking, equation (L16)			1.7240 ZC3
Total CO2 emissions			30.9922 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			30.9922 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.9100 (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	140.1400	18.2800	121.8600	0.1800	21.9348		(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)			282.7600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.1711		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.3892 (36)
Total fabric heat loss						(33) + (36) =	83.5603 (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	135.7932	135.4722	135.1575	133.6796	133.4031	132.1158	132.1158	131.8774	132.6117	133.4031	133.9625	134.5473 (39)
Average = Sum(39)m / 12 =												133.6783 (39)
HLP	1.2569	1.2539	1.2510	1.2373	1.2348	1.2228	1.2228	1.2206	1.2274	1.2348	1.2399	1.2453 (40)
HLP (average)												1.2373 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	48.6962	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	55.2515	55.3824	55.5114	56.1251	56.2414	56.7894	56.7894	56.8920	56.5771	56.2414	56.0066	55.7631	
alpha	4.6834	4.6922	4.7008	4.7417	4.7494	4.7860	4.7860	4.7928	4.7718	4.7494	4.7338	4.7175	
util living area	0.9990	0.9977	0.9933	0.9760	0.9211	0.7920	0.6301	0.6926	0.9084	0.9882	0.9979	0.9992	(86)
MIT	19.5379	19.6878	19.9613	20.3337	20.6719	20.8977	20.9738	20.9594	20.7782	20.3325	19.8697	19.5149	(87)
Th 2	19.8748	19.8771	19.8794	19.8903	19.8923	19.9018	19.9018	19.9035	19.8981	19.8923	19.8882	19.8839	(88)
util rest of house	0.9986	0.9969	0.9907	0.9658	0.8852	0.7009	0.4899	0.5546	0.8515	0.9816	0.9971	0.9990	(89)
MIT 2	17.9240	18.1446	18.5450	19.0893	19.5551	19.8293	19.8917	19.8857	19.7051	19.0948	18.4187	17.8965	(90)
Living area fraction	18.1579	18.3682	18.7503	19.2697	19.7170	19.9841	20.0486	20.0413	19.8606	19.2742	18.6290	18.1311	(91)
Temperature adjustment	18.1579	18.3682	18.7503	19.2697	19.7170	19.9841	20.0486	20.0413	19.8606	19.2742	18.6290	18.1311	(92)
adjusted MIT	18.1579	18.3682	18.7503	19.2697	19.7170	19.9841	20.0486	20.0413	19.8606	19.2742	18.6290	18.1311	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9951	0.9868	0.9579	0.8781	0.7087	0.5100	0.5737	0.8490	0.9761	0.9954	0.9983	(94)
Useful gains	552.3725	641.2764	737.9992	823.2875	817.3648	649.8724	445.7331	463.2509	613.3393	600.2040	539.1595	521.7778	(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	1881.8080	1824.5727	1655.7163	1386.2113	1069.4921	711.3267	455.6107	480.2104	763.9244	1157.1698	1544.4559	1874.3900	(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	989.1000	795.1751	682.7815	405.3052	187.5827	0.0000	0.0000	0.0000	0.0000	414.3825	723.8134	1006.3435	(98)
Space heating												5204.4839	(98)
Space heating per m2												48.1718	(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													5572.2526 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	989.1000	795.1751	682.7815	405.3052	187.5827	0.0000	0.0000	0.0000	0.0000	414.3825	723.8134	1006.3435	(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)	1058.9936	851.3652	731.0295	433.9456	200.8381	0.0000	0.0000	0.0000	0.0000	443.6643	774.9608	1077.4555	(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	88.4119	88.2610	87.9019	87.0582	85.2646	80.3000	80.3000	80.3000	80.3000	87.0187	88.0413	88.4776	(216)
Fuel for water heating, kWh/month	243.5484	215.0257	226.7329	204.4906	202.1477	189.0478	181.1222	201.9088	204.1387	212.8796	222.5080	237.5058	(219)
Water heating fuel used												2541.0563	(219)
Annual totals kWh/year													
Space heating fuel - main system												5572.2526	(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												8635.9697	(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	5572.2526	0.2160	1203.6066 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2541.0563	0.2160	548.8682 (264)
Space and water heating			1752.4747 (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			2023.7357 (272)
Emissions per m2 for space and water heating			16.2206 (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) = (16.2206 * 1.00) + 2.1505 + 0.3603, rounded to 2 d.p.			18.7300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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					3.9500
Infiltration rate					0.3476 (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) =	0.2955 (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	0.3767	0.3693	0.3620	0.3250	0.3176	0.2807	0.2807	0.2733	0.2955	0.3176	0.3324	0.3472 (22b)
Effective ac	0.5710	0.5682	0.5655	0.5528	0.5504	0.5394	0.5394	0.5374	0.5437	0.5504	0.5552	0.5603 (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	0.1388	2.8057	20.0000	404.4000 (28a)
Brick and Block	140.1400	18.2800	121.8600	0.2400	29.2464	42.2200	5144.9292 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2125	2.6771	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)			282.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.4139		(33)
Ground Floor Stud			29.9100			9.0000	269.1900 (32c)
Ground Floor Block			50.2200			75.0000	3766.5000 (32c)
First Floor Stud			146.4800			9.0000	1318.3200 (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) =	16892.9042 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.3579 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.2612 (36)
Total fabric heat loss						(33) + (36) =	89.6750 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	50.2058	49.9635	49.7260	48.6105	48.4018	47.4302	47.4302	47.2502	47.8044	48.4018	48.8240	49.2654 (38)
Average = Sum(39)m / 12 =	139.8808	139.6385	139.4010	138.2855	138.0768	137.1052	137.1052	136.9252	137.4794	138.0768	138.4990	138.9404 (39)
												138.2845 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2947	1.2925	1.2903	1.2799	1.2780	1.2690	1.2690	1.2674	1.2725	1.2780	1.2819	1.2860 (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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	33.5462	33.6044	33.6617	33.9332	33.9845	34.2254	34.2254	34.2703	34.1322	33.9845	33.8809	33.7733	
alpha	3.2364	3.2403	3.2441	3.2622	3.2656	3.2817	3.2817	3.2847	3.2755	3.2656	3.2587	3.2516	
util living area	0.9944	0.9899	0.9785	0.9480	0.8823	0.7651	0.6283	0.6847	0.8733	0.9695	0.9910	0.9954	(86)
MIT	18.8194	19.0281	19.4119	19.9274	20.4054	20.7559	20.9092	20.8769	20.5789	19.9476	19.2893	18.7817	(87)
Th 2	19.8450	19.8467	19.8485	19.8566	19.8581	19.8652	19.8652	19.8665	19.8624	19.8581	19.8550	19.8518	(88)
util rest of house	0.9931	0.9875	0.9730	0.9336	0.8461	0.6854	0.4993	0.5613	0.8193	0.9585	0.9884	0.9944	(89)
MIT 2	17.8559	18.0649	18.4471	18.9588	19.4133	19.7235	19.8311	19.8155	19.5843	18.9867	18.3321	17.8232	(90)
Living area fraction	17.9956	18.2045	18.5869	19.0992	19.5571	19.8731	19.9873	19.9694	19.7284	19.1259	18.4709	17.9621	(91)
MIT	17.9956	18.2045	18.5869	19.0992	19.5571	19.8731	19.9873	19.9694	19.7284	19.1259	18.4709	17.9621	(92)
Temperature adjustment	17.9956	18.2045	18.5869	19.0992	19.5571	19.8731	19.9873	19.9694	19.7284	19.1259	18.4709	17.9621	(93)
adjusted MIT	17.9956	18.2045	18.5869	19.0992	19.5571	19.8731	19.9873	19.9694	19.7284	19.1259	18.4709	17.9621	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	501.9431	588.2206	679.0889	753.5781	743.9908	604.1684	432.1295	441.9422	554.3829	543.7216	489.0809	472.9659	(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	1915.7498	1857.8278	1684.9326	1410.3960	1084.8847	722.9719	464.4218	488.7375	773.7935	1177.2356	1574.8552	1912.1177	(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	1051.8722	853.1761	748.3477	472.9089	253.6251	0.0000	0.0000	0.0000	0.0000	471.3344	781.7574	1070.7289	(98)
Space heating												5703.7508	(98)
Space heating per m2										(98) / (4) =		52.7930	(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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Calculation Type: New Build (As Built)

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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	1288.7886	1014.5783	1040.6318	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7171	0.7927	0.7549	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	924.2411	804.2957	785.5331	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	154.7303	211.6629	166.6785	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													
Cooled fraction									FC = cooled area / (4) =			533.0718	(104)
Intermittency factor (Table 10b)												1.0000	(105)
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.6826	52.9157	41.6696	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													
Space cooling per m2												133.2679	(107)
Energy for space heating												1.2335	(108)
Energy for space cooling												52.7930	(99)
Total												1.2335	(108)
Dwelling Fabric Energy Efficiency (DFEE)												54.0265	(109)
												54.0	(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	140.1400	18.2800	121.8600	0.1800	21.9348		(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)			282.7600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.1711		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.3892 (36)
Total fabric heat loss						(33) + (36) =	83.5603 (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	135.7932	135.4722	135.1575	133.6796	133.4031	132.1158	132.1158	131.8774	132.6117	133.4031	133.9625	134.5473 (39)
Average = Sum(39)m / 12 =												133.6783 (39)
HLP	1.2569	1.2539	1.2510	1.2373	1.2348	1.2228	1.2228	1.2206	1.2274	1.2348	1.2399	1.2453 (40)
HLP (average)												1.2373 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	55.2515	55.3824	55.5114	56.1251	56.2414	56.7894	56.7894	56.8920	56.5771	56.2414	56.0066	55.7631
alpha	4.6834	4.6922	4.7008	4.7417	4.7494	4.7860	4.7860	4.7928	4.7718	4.7494	4.7338	4.7175
util living area	0.9993	0.9983	0.9948	0.9801	0.9311	0.8099	0.6508	0.7167	0.9228	0.9911	0.9986	0.9995 (86)
MIT	19.4984	19.6491	19.9248	20.3020	20.6486	20.8865	20.9700	20.9529	20.7562	20.2986	19.8320	19.4759 (87)
Th 2	19.8748	19.8771	19.8794	19.8903	19.8923	19.9018	19.9018	19.9035	19.8981	19.8923	19.8882	19.8839 (88)
util rest of house	0.9991	0.9977	0.9927	0.9714	0.8984	0.7213	0.5085	0.5782	0.8717	0.9861	0.9980	0.9993 (89)
MIT 2	18.5033	18.6557	18.9323	19.3131	19.6425	19.8458	19.8938	19.8891	19.7496	19.3149	18.8473	18.4880 (90)
Living area fraction									fLA = Living area / (4) =			0.1449 (91)
MIT	18.6475	18.7997	19.0762	19.4564	19.7883	19.9966	20.0498	20.0433	19.8955	19.4575	18.9900	18.6312 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6475	18.7997	19.0762	19.4564	19.7883	19.9966	20.0498	20.0433	19.8955	19.4575	18.9900	18.6312 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	506.3226	596.7574	697.2579	790.9158	797.6621	642.9324	444.2340	460.2990	595.5251	563.4653	495.6956	476.4143 (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	1948.2989	1883.0203	1699.7624	1411.1770	1079.0074	712.9784	455.7672	480.4640	768.5507	1181.6137	1592.8139	1941.6824 (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	1072.8304	864.3687	745.8634	446.5881	209.3209	0.0000	0.0000	0.0000	0.0000	459.9024	789.9252	1090.1595 (98)
Space heating												5678.9584 (98)
Space heating per m2										(98) / (4) =		52.5635 (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	1241.8887	977.6571	1002.2686	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7896	0.8685	0.8304	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	980.6244	849.0891	832.2419	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	114.1343	178.3366	131.9271	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												424.3981 (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	28.5336	44.5842	32.9818	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												106.0995 (107)
Space cooling per m2												0.9820 (108)
Energy for space heating												52.5635 (99)
Energy for space cooling												0.9820 (108)
Total												53.5455 (109)
Target Fabric Energy Efficiency (TFEE)												61.6 (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							4 * 10 =	40.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						40.0000 / (5) =	0.1501 (8)				
Pressure test							Yes					
Measured/design AP50								3.9500				
Infiltration rate								0.3476 (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) =	0.2955 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.3472	0.3250	0.3250	0.2955	0.3029	0.2881	0.2881	0.2807	0.2807	0.3029	0.2955	0.3029 (22b)
Effective ac	0.5603	0.5528	0.5528	0.5437	0.5459	0.5415	0.5415	0.5394	0.5394	0.5459	0.5437	0.5459 (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	0.1388	2.8057	20.0000	404.4000 (28a)
Brick and Block	140.1400	18.2800	121.8600	0.2400	29.2464	42.2200	5144.9292 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2125	2.6771	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)			282.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.4139		(33)
Ground Floor Stud			29.9100			9.0000	269.1900 (32c)
Ground Floor Block			50.2200			75.0000	3766.5000 (32c)
First Floor Stud			146.4800			9.0000	1318.3200 (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) =	17288.0942 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0157 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.2612 (36)
Total fabric heat loss						(33) + (36) =	89.6750 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan 49.2654	Feb 48.6105	Mar 48.6105	Apr 47.8044	May 47.9987	Jun 47.6149	Jul 47.6149	Aug 47.4302	Sep 47.4302	Oct 47.9987	Nov 47.8044	Dec 47.9987 (38)
Heat transfer coeff	138.9404	138.2855	138.2855	137.4794	137.6737	137.2899	137.2899	137.1052	137.1052	137.6737	137.4794	137.6737 (39)
Average = Sum(39)m / 12 =												137.6901 (39)
HLP	Jan 1.2860	Feb 1.2799	Mar 1.2799	Apr 1.2725	May 1.2743	Jun 1.2707	Jul 1.2707	Aug 1.2690	Sep 1.2690	Oct 1.2743	Nov 1.2725	Dec 1.2743 (40)
HLP (average)												1.2744 (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)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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)
	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	Specific data or Table 6b	Specific data FF 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)													
tau	34.5634	34.7271	34.7271	34.9307	34.8814	34.9789	34.9789	35.0260	35.0260	34.8814	34.9307	34.8814	
alpha	3.3042	3.3151	3.3151	3.3287	3.3254	3.3319	3.3319	3.3351	3.3351	3.3254	3.3287	3.3254	
util living area	0.9770	0.9680	0.9412	0.8765	0.7614	0.5588	0.4089	0.4142	0.6898	0.8937	0.9614	0.9802	(86)
MIT	19.3827	19.5362	19.8905	20.3481	20.7132	20.9295	20.9820	20.9819	20.8531	20.4225	19.8507	19.3668	(87)
Th 2	19.8518	19.8566	19.8566	19.8624	19.8610	19.8638	19.8638	19.8652	19.8652	19.8610	19.8624	19.8610	(88)
util rest of house	0.9715	0.9604	0.9268	0.8450	0.6977	0.4532	0.2747	0.2742	0.5904	0.8577	0.9503	0.9754	(89)
MIT 2	18.4169	18.5711	18.9166	19.3548	19.6757	19.8345	19.8603	19.8618	19.7925	19.4333	18.8875	18.4083	(90)
Living area fraction									fLA = Living area / (4) =			0.1449	(91)
MIT	18.5569	18.7110	19.0578	19.4988	19.8261	19.9932	20.0229	20.0242	19.9462	19.5767	19.0271	18.5473	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5569	18.7110	19.0578	19.4988	19.8261	19.9932	20.0229	20.0242	19.9462	19.5767	19.0271	18.5473	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9632	0.9504	0.9141	0.8331	0.6955	0.4660	0.2942	0.2946	0.5984	0.8466	0.9395	0.9679	(94)
Ext temp.	751.7059	814.6041	883.4376	898.4305	771.0230	534.0160	314.9274	301.1391	557.9847	696.2073	712.7639	710.5855	(95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Month fracti	1800.2305	1757.7484	1584.4464	1292.1420	926.0072	561.9547	318.9075	304.9474	623.3128	1029.3490	1433.5146	1768.7308	(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	780.1023	633.7930	521.5506	283.4723	115.3083	0.0000	0.0000	0.0000	0.0000	247.8574	518.9405	787.2601	(98)
RHI space heating demand												3888.2844	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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					3.9500
Infiltration rate					0.3476 (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) =	0.2955 (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	0.3767	0.3693	0.3620	0.3250	0.3176	0.2807	0.2807	0.2733	0.2955	0.3176	0.3324	0.3472 (22b)
Effective ac	0.5710	0.5682	0.5655	0.5528	0.5504	0.5394	0.5394	0.5374	0.5437	0.5504	0.5552	0.5603 (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	0.1388	2.8057	20.0000	404.4000 (28a)
Brick and Block	140.1400	18.2800	121.8600	0.2400	29.2464	42.2200	5144.9292 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2125	2.6771	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)			282.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.4139		(33)
Ground Floor Stud			29.9100			9.0000	269.1900 (32c)
Ground Floor Block			50.2200			75.0000	3766.5000 (32c)
First Floor Stud			146.4800			9.0000	1318.3200 (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) =	17288.0942 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0157 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.2612 (36)
Total fabric heat loss						(33) + (36) =	89.6750 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	50.2058	49.9635	49.7260	48.6105	48.4018	47.4302	47.4302	47.2502	47.8044	48.4018	48.8240	49.2654 (38)
Average = Sum(39)m / 12 =	139.8808	139.6385	139.4010	138.2855	138.0768	137.1052	137.1052	136.9252	137.4794	138.0768	138.4990	138.9404 (39)
												138.2845 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2947	1.2925	1.2903	1.2799	1.2780	1.2690	1.2690	1.2674	1.2725	1.2780	1.2819	1.2860 (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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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)
	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												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (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)
Total internal gains	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)
	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	Solar flux	g	FF	Access	Gains
	m2	Table 6a	or Table 6b	Specific data or Table 6c	factor Table 6d	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
Total gains	752.7467	840.6691	934.3397	1032.0769	1089.5783	1065.2049
						535.6706
						461.8104
						362.5182
						228.5579
						125.2317
						83.4835 (83)
						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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	34.3310	34.3906	34.4492	34.7271	34.7796	35.0260	35.0260	35.0720	34.9307	34.7796	34.6735	34.5634
util living area	3.2887	3.2927	3.2966	3.3151	3.3186	3.3351	3.3351	3.3381	3.3287	3.3186	3.3116	3.3042
MIT	0.9835	0.9751	0.9562	0.9118	0.8271	0.6900	0.5458	0.5934	0.7981	0.9344	0.9751	0.9859 (86)
Th 2	19.1302	19.3252	19.6768	20.1389	20.5495	20.8320	20.9435	20.9242	20.7072	20.1717	19.5677	19.0890 (87)
util rest of house	19.8450	19.8467	19.8485	19.8566	19.8581	19.8652	19.8652	19.8665	19.8624	19.8581	19.8550	19.8518 (88)
MIT 2	0.9798	0.9695	0.9458	0.8897	0.7811	0.6045	0.4236	0.4724	0.7284	0.9133	0.9685	0.9827 (89)
Living area fraction	18.1612	18.3552	18.7023	19.1545	19.5340	19.7732	19.8455	19.8377	19.6818	19.1959	18.6035	18.1255 (90)
MIT	18.3017	18.4958	18.8435	19.2972	19.6812	19.9267	20.0046	19.9952	19.8304	19.3373	18.7433	18.2651 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3017	18.4958	18.8435	19.2972	19.6812	19.9267	20.0046	19.9952	19.8304	19.3373	18.7433	18.2651 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9730	0.9607	0.9342	0.8764	0.7728	0.6096	0.4397	0.4873	0.7261	0.9010	0.9598	0.9766 (94)
Ext temp.	732.4479	807.6262	872.8416	904.5439	842.0140	649.3414	447.3415	464.4583	636.9095	705.8873	695.6150	700.2547 (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	1958.5627	1898.4984	1720.6982	1437.7836	1102.0207	730.3115	466.7941	492.2677	787.8188	1206.4224	1612.5849	1954.2160 (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	912.2294	733.0661	630.8053	383.9326	193.4450	0.0000	0.0000	0.0000	0.0000	372.3981	660.2183	932.9472 (98)
Space heating per m2												4819.0420 (98)
												(98) / (4) = 44.6042 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5342.6187 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	912.2294	733.0661	630.8053	383.9326	193.4450	0.0000	0.0000	0.0000	0.0000	372.3981	660.2183	932.9472	(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)	1011.3408	812.7119	699.3407	425.6459	214.4623	0.0000	0.0000	0.0000	0.0000	412.8582	731.9493	1034.3095	(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	87.7712	87.5967	87.1908	86.2609	84.2382	76.4000	76.4000	76.4000	76.4000	86.0665	87.3243	76.4000	(216)
Fuel for water heating, kWh/month	188.0306	164.8067	170.8849	150.5947	147.9420	140.7348	130.4115	149.6761	151.4911	156.7120	168.5725	181.8754	(219)
Water heating fuel used												1901.7324	(219)
Annual totals kWh/year													
Space heating fuel - main system												5342.6187	(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)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 908 * 1.00) =												-871.5401	(233)
Total delivered energy for all uses												6895.4720	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5342.6187	3.4800	185.9231 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1901.7324	3.4800	66.1803 (247)
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	-871.5401	13.1900	-114.9561 (252)
Total energy cost			326.0863 (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] =	0.8949 (257)
SAP value		87.5161
SAP rating (Section 12)		88 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5342.6187	0.2160	1154.0056 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1901.7324	0.2160	410.7742 (264)
Space and water heating			1564.7798 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	447.6609	0.5190	232.3360 (268)
Energy saving/generation technologies			
PV Unit	-871.5401	0.5190	-452.3293 (269)
Total kg/year			1383.7116 (272)
CO2 emissions per m2			12.8100 (273)
EI value			87.8844
EI rating			88 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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	$3.48 / 0.8333 = 4.176$, stars = 4
Water heating environmental impact	$0.216 / 0.8333 = 0.2592$, 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	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) =	0.1501 (8)	
Pressure test										Yes							
Measured/design AP50										3.9500							
Infiltration rate										0.3476 (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) =					0.2955 (21)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000	(22)				
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250	(22a)				
Adj infilt rate	0.3472	0.3250	0.3250	0.2955	0.3029	0.2881	0.2881	0.2807	0.2807	0.3029	0.2955	0.3029	(22b)				
Effective ac	0.5603	0.5528	0.5528	0.5437	0.5459	0.5415	0.5415	0.5394	0.5394	0.5459	0.5437	0.5459	(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	0.1388	2.8057	20.0000	404.4000 (28a)
Brick and Block	140.1400	18.2800	121.8600	0.2400	29.2464	42.2200	5144.9292 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2125	2.6771	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)			282.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.4139		(33)
Ground Floor Stud			29.9100			9.0000	269.1900 (32c)
Ground Floor Block			50.2200			75.0000	3766.5000 (32c)
First Floor Stud			146.4800			9.0000	1318.3200 (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) =	17288.0942 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0157 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.2612 (36)
Total fabric heat loss						(33) + (36) =	89.6750 (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	49.2654	48.6105	48.6105	47.8044	47.9987	47.6149	47.6149	47.4302	47.4302	47.9987	47.8044	47.9987 (38)
Heat transfer coeff	138.9404	138.2855	138.2855	137.4794	137.6737	137.2899	137.2899	137.1052	137.1052	137.6737	137.4794	137.6737 (39)
Average = Sum(39)m / 12 =												137.6901 (39)
HLP	1.2860	1.2799	1.2799	1.2725	1.2743	1.2707	1.2707	1.2690	1.2690	1.2743	1.2725	1.2743 (40)
HLP (average)												1.2744 (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)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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)
	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												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	Solar flux	g	FF	Access	Gains
	m2	Table 6a	or Table 6b	Specific data or Table 6c	factor Table 6d	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
Total gains	780.4240	857.1288	966.4890	1078.4655	1108.6197	1145.8659
						1070.6092
						1022.1793
						932.4772
						822.3606
						758.6240
						100.6611 (83)
						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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	34.5634	34.7271	34.7271	34.9307	34.8814	34.9789	34.9789	35.0260	35.0260	34.8814	34.9307	34.8814
util living area	3.3042	3.3151	3.3151	3.3287	3.3254	3.3319	3.3319	3.3351	3.3351	3.3254	3.3287	3.3254
MIT	0.9770	0.9680	0.9412	0.8765	0.7614	0.5588	0.4089	0.4142	0.6898	0.8937	0.9614	0.9802 (86)
Th 2	19.3827	19.5362	19.8905	20.3481	20.7132	20.9295	20.9820	20.9819	20.8531	20.4225	19.8507	19.3668 (87)
util rest of house	19.8518	19.8566	19.8566	19.8624	19.8610	19.8638	19.8638	19.8652	19.8652	19.8610	19.8624	19.8610 (88)
MIT 2	0.9715	0.9604	0.9268	0.8450	0.6977	0.4532	0.2747	0.2742	0.5904	0.8577	0.9503	0.9754 (89)
Living area fraction	18.4169	18.5711	18.9166	19.3548	19.6757	19.8345	19.8603	19.8618	19.7925	19.4333	18.8875	18.4083 (90)
MIT	18.5569	18.7110	19.0578	19.4988	19.8261	19.9932	20.0229	20.0242	19.9462	19.5767	19.0271	18.5473 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5569	18.7110	19.0578	19.4988	19.8261	19.9932	20.0229	20.0242	19.9462	19.5767	19.0271	18.5473 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9632	0.9504	0.9141	0.8331	0.6955	0.4660	0.2942	0.2946	0.5984	0.8466	0.9395	0.9679 (94)
Ext temp.	751.7059	814.6041	883.4376	898.4305	771.0230	534.0160	314.9274	301.1391	557.9847	696.2073	712.7639	710.5855 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1800.2305	1757.7484	1584.4464	1292.1420	926.0072	561.9547	318.9075	304.9474	623.3128	1029.3490	1433.5146	1768.7308 (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	780.1023	633.7930	521.5506	283.4723	115.3083	0.0000	0.0000	0.0000	0.0000	247.8574	518.9405	787.2601 (98)
Space heating per m2												3888.2844 (98)
										(98) / (4) =		35.9893 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4310.7366 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	780.1023	633.7930	521.5506	283.4723	115.3083	0.0000	0.0000	0.0000	0.0000	247.8574	518.9405	787.2601	(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)	864.8584	702.6530	578.2157	314.2708	127.8362	0.0000	0.0000	0.0000	0.0000	274.7865	575.3221	872.7939	(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	87.4420	87.2754	86.7195	85.3550	82.4632	76.4000	76.4000	76.4000	76.4000	84.8020	86.7378	76.4000	(216)
Fuel for water heating, kWh/month	188.7384	165.4136	171.8138	152.1929	151.1264	140.7348	130.4115	149.6761	151.4911	159.0489	169.7123	182.5955	(219)
Water heating fuel used												1912.9553	(219)
Annual totals kWh/year													
Space heating fuel - main system												4310.7366	(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)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1030 * 1.00) =										-988.8570		-988.8570	(233)
Total delivered energy for all uses												5757.4958	(238)

10a. Fuel costs - using BEDF prices (£51)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4310.7366	7.3800	318.1324 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1912.9553	7.3800	141.1761 (247)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Energy for lighting	447.6609	28.6600	128.2996 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-988.8570	28.6600	-283.4064 (252)
Total energy cost			432.6967 (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	4310.7366	0.2160	931.1191 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1912.9553	0.2160	413.1983 (264)
Space and water heating			1344.3175 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	447.6609	0.5190	232.3360 (268)
Energy saving/generation technologies			
PV Unit	-988.8570	0.5190	-513.2168 (269)
Total kg/year			1102.3617 (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	4310.7366	1.2200	5259.0987 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1912.9553	1.2200	2333.8054 (264)
Space and water heating			7592.9041 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	447.6609	3.0700	1374.3191 (268)
Energy saving/generation technologies			
PV Unit	-988.8570	3.0700	-3035.7910 (269)

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Primary energy kWh/year
Primary energy kWh/m²/year

6161.6822 (272)
57.0315 (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
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	Recommended
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
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
L2	Not applicable
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 66	-209 kg (19.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£66 1.94 kg/m ²	B 89	B 90
Total Savings	£66 1.94 kg/m ²		

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

Fuel prices for cost data on this page from database revision number 551 TEST (31 Jul 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	£164	-£14
Mains gas	£566	£486	£80
Space heating	£447	£447	£0
Water heating	£141	£75	£66
Lighting	£128	£128	£0
Generated (PV)	-£283	-£283	£0
Total cost of fuels	£433	£367	£66
Total cost of uses	£433	£367	£66
Delivered energy	53 kWh/m ²	44 kWh/m ²	10 kWh/m ²
Carbon dioxide emissions	1.1 tonnes	0.9 tonnes	0.2 tonnes
CO2 emissions per m ²	10 kg/m ²	8 kg/m ²	2 kg/m ²
Primary energy	57 kWh/m ²	46 kWh/m ²	11 kWh/m ²

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 heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1501 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3476 (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) =	0.2955 (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	0.3767	0.3693	0.3620	0.3250	0.3176	0.2807	0.2807	0.2733	0.2955	0.3176	0.3324	0.3472 (22b)
Effective ac	0.5710	0.5682	0.5655	0.5528	0.5504	0.5394	0.5394	0.5374	0.5437	0.5504	0.5552	0.5603 (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	0.1388	2.8057	20.0000	404.4000 (28a)
Brick and Block	140.1400	18.2800	121.8600	0.2400	29.2464	42.2200	5144.9292 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2125	2.6771	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)			282.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.4139		(33)
Ground Floor Stud			29.9100			9.0000	269.1900 (32c)
Ground Floor Block			50.2200			75.0000	3766.5000 (32c)
First Floor Stud			146.4800			9.0000	1318.3200 (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) =	17288.0942 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0157 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.2612 (36)
Total fabric heat loss						(33) + (36) =	89.6750 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	50.2058	49.9635	49.7260	48.6105	48.4018	47.4302	47.4302	47.2502	47.8044	48.4018	48.8240	49.2654 (38)
Average = Sum(39)m / 12 =	139.8808	139.6385	139.4010	138.2855	138.0768	137.1052	137.1052	136.9252	137.4794	138.0768	138.4990	138.9404 (39)
												138.2845 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2947	1.2925	1.2903	1.2799	1.2780	1.2690	1.2690	1.2674	1.2725	1.2780	1.2819	1.2860 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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)
	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)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	34.3310	34.3906	34.4492	34.7271	34.7796	35.0260	35.0260	35.0720	34.9307	34.7796	34.6735	34.5634
alpha	3.2887	3.2927	3.2966	3.3151	3.3186	3.3351	3.3351	3.3381	3.3287	3.3186	3.3116	3.3042
util living area	0.9835	0.9751	0.9562	0.9118	0.8271	0.6900	0.5458	0.5934	0.7981	0.9344	0.9751	0.9859 (86)
MIT	19.1302	19.3252	19.6768	20.1389	20.5495	20.8320	20.9435	20.9242	20.7072	20.1717	19.5677	19.0890 (87)
Th 2	19.8450	19.8467	19.8485	19.8566	19.8581	19.8652	19.8652	19.8665	19.8624	19.8581	19.8550	19.8518 (88)
util rest of house	0.9798	0.9695	0.9458	0.8897	0.7811	0.6045	0.4236	0.4724	0.7284	0.9133	0.9685	0.9827 (89)
MIT 2	18.1612	18.3552	18.7023	19.1545	19.5340	19.7732	19.8455	19.8377	19.6818	19.1959	18.6035	18.1255 (90)
Living area fraction									fLA = Living area / (4) =			0.1449 (91)
MIT	18.3017	18.4958	18.8435	19.2972	19.6812	19.9267	20.0046	19.9952	19.8304	19.3373	18.7433	18.2651 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3017	18.4958	18.8435	19.2972	19.6812	19.9267	20.0046	19.9952	19.8304	19.3373	18.7433	18.2651 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9607	0.9342	0.8764	0.7728	0.6096	0.4397	0.4873	0.7261	0.9010	0.9598	0.9766	(94)
Useful gains	732.4479	807.6262	872.8416	904.5439	842.0140	649.3414	447.3415	464.4583	636.9095	705.8873	695.6150	700.2547	(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	1958.5627	1898.4984	1720.6982	1437.7836	1102.0207	730.3115	466.7941	492.2677	787.8188	1206.4224	1612.5849	1954.2160	(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	912.2294	733.0661	630.8053	383.9326	193.4450	0.0000	0.0000	0.0000	0.0000	372.3981	660.2183	932.9472	(98)
Space heating												4819.0420	(98)
Space heating per m2												(98) / (4) =	44.6042 (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													5342.6187 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	912.2294	733.0661	630.8053	383.9326	193.4450	0.0000	0.0000	0.0000	0.0000	372.3981	660.2183	932.9472	(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)	1011.3408	812.7119	699.3407	425.6459	214.4623	0.0000	0.0000	0.0000	0.0000	412.8582	731.9493	1034.3095	(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	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)
Efficiency of water heater (217)m	88.0872	88.2521	88.4631	88.9175	89.7675	76.4000	76.4000	76.4000	76.4000	87.3863	87.8101	88.1406	(216)
Fuel for water heating, kWh/month	158.5685	115.6347	86.9607	37.4722	5.9054	0.0000	0.0000	17.2906	47.8067	92.4426	133.3861	157.2588	(219)
Water heating fuel used												852.7264	(219)
Annual totals kWh/year													
Space heating fuel - main system												5342.6187	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												447.6609	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 908 * 1.00) =										-871.5401		-871.5401	(233)
Total delivered energy for all uses												5896.4659	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5342.6187	3.4800	185.9231	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	852.7264	3.4800	29.6749	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	447.6609	13.1900	59.0465	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-871.5401	13.1900	-114.9561	(252)
Total energy cost			296.1758	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200 (256)
Energy cost factor (ECF)			0.8128 (257)
SAP value		[(255) x (256)] / [(4) + 45.0] =	88.6612
SAP rating (Section 12)			89 (258)
SAP band			B

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Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	5342.6187	0.2160	1154.0056 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	852.7264	0.2160	184.1889 (264)
Space and water heating			1338.1945 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	447.6609	0.5190	232.3360 (268)
Energy saving/generation technologies			
PV Unit	-871.5401	0.5190	-452.3293 (269)
Total kg/year			1183.0763 (272)
CO2 emissions per m2			10.9500 (273)
EI value			89.6411
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											4 * 10 =	40.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										40.0000 / (5) =	0.1501 (8)
Pressure test											Yes	
Measured/design AP50											3.9500	
Infiltration rate											0.3476 (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) =	0.2955 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.3472	0.3250	0.3250	0.2955	0.3029	0.2881	0.2881	0.2807	0.2807	0.3029	0.2955	0.3029 (22b)
Effective ac	0.5603	0.5528	0.5528	0.5437	0.5459	0.5415	0.5415	0.5394	0.5394	0.5459	0.5437	0.5459 (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	0.1388	2.8057	20.0000	404.4000 (28a)
Brick and Block	140.1400	18.2800	121.8600	0.2400	29.2464	42.2200	5144.9292 (29a)
Wall to Garage	14.3600	1.7600	12.6000	0.2125	2.6771	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)			282.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.4139		(33)
Ground Floor Stud			29.9100			9.0000	269.1900 (32c)
Ground Floor Block			50.2200			75.0000	3766.5000 (32c)
First Floor Stud			146.4800			9.0000	1318.3200 (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) =	17288.0942 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.0157 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.2612 (36)
Total fabric heat loss						(33) + (36) =	89.6750 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan 49.2654	Feb 48.6105	Mar 48.6105	Apr 47.8044	May 47.9987	Jun 47.6149	Jul 47.6149	Aug 47.4302	Sep 47.4302	Oct 47.9987	Nov 47.8044	Dec 47.9987 (38)
Heat transfer coeff	138.9404	138.2855	138.2855	137.4794	137.6737	137.2899	137.2899	137.1052	137.1052	137.6737	137.4794	137.6737 (39)
Average = Sum(39)m / 12 =												137.6901 (39)
HLP	Jan 1.2860	Feb 1.2799	Mar 1.2799	Apr 1.2725	May 1.2743	Jun 1.2707	Jul 1.2707	Aug 1.2690	Sep 1.2690	Oct 1.2743	Nov 1.2725	Dec 1.2743 (40)
HLP (average)												1.2744 (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)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy 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)
	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)

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	Solar flux		g	FF		Access		Gains	
					m2	Table 6a		Specific data	Specific data		factor		W	
						W/m2		or Table 6b	or Table 6c		Table 6d			
North					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	34.5634	34.7271	34.7271	34.9307	34.8814	34.9789	34.9789	35.0260	35.0260	34.8814	34.9307	34.8814
alpha	3.3042	3.3151	3.3151	3.3287	3.3254	3.3319	3.3319	3.3351	3.3351	3.3254	3.3287	3.3254
util living area	0.9770	0.9680	0.9412	0.8765	0.7614	0.5588	0.4089	0.4142	0.6898	0.8937	0.9614	0.9802 (86)
MIT	19.3827	19.5362	19.8905	20.3481	20.7132	20.9295	20.9820	20.9819	20.8531	20.4225	19.8507	19.3668 (87)
Th 2	19.8518	19.8566	19.8566	19.8624	19.8610	19.8638	19.8638	19.8652	19.8652	19.8610	19.8624	19.8610 (88)
util rest of house	0.9715	0.9604	0.9268	0.8450	0.6977	0.4532	0.2747	0.2742	0.5904	0.8577	0.9503	0.9754 (89)
MIT 2	18.4169	18.5711	18.9166	19.3548	19.6757	19.8345	19.8603	19.8618	19.7925	19.4333	18.8875	18.4083 (90)
Living area fraction									fLA = Living area / (4) =			0.1449 (91)
MIT	18.5569	18.7110	19.0578	19.4988	19.8261	19.9932	20.0229	20.0242	19.9462	19.5767	19.0271	18.5473 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5569	18.7110	19.0578	19.4988	19.8261	19.9932	20.0229	20.0242	19.9462	19.5767	19.0271	18.5473 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9632	0.9504	0.9141	0.8331	0.6955	0.4660	0.2942	0.2946	0.5984	0.8466	0.9395	0.9679	(94)
Useful gains	751.7059	814.6041	883.4376	898.4305	771.0230	534.0160	314.9274	301.1391	557.9847	696.2073	712.7639	710.5855	(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	1800.2305	1757.7484	1584.4464	1292.1420	926.0072	561.9547	318.9075	304.9474	623.3128	1029.3490	1433.5146	1768.7308	(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	780.1023	633.7930	521.5506	283.4723	115.3083	0.0000	0.0000	0.0000	0.0000	247.8574	518.9405	787.2601	(98)
Space heating												3888.2844	(98)
Space heating per m2											(98) / (4) =	35.9893	(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													4310.7366 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	780.1023	633.7930	521.5506	283.4723	115.3083	0.0000	0.0000	0.0000	0.0000	247.8574	518.9405	787.2601	(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)	864.8584	702.6530	578.2157	314.2708	127.8362	0.0000	0.0000	0.0000	0.0000	274.7865	575.3221	872.7939	(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	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)
Efficiency of water heater (217)m	87.8538	87.9939	88.1804	88.6059	88.9061	76.4000	76.4000	76.4000	76.4000	86.5104	87.3959	76.4000	(216)
Fuel for water heating, kWh/month	154.0619	116.0835	85.8870	35.3888	11.3655	0.0000	0.0000	8.7068	41.1547	88.5600	128.2570	155.1627	(219)
Water heating fuel used												824.6278	(219)
Annual totals kWh/year													
Space heating fuel - main system												4310.7366	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												447.6609	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1030 * 1.00) =										-988.8570		-988.8570	(233)
Total delivered energy for all uses												4719.1684	(238)

10a. Fuel costs - using BEDF prices (551)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4310.7366	7.3800	318.1324	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	824.6278	7.3800	60.8575	(247)
Pumps and fans for heating	75.0000	28.6600	21.4950	(249)
Pump for solar water heating	50.0000	28.6600	14.3300	(249)
Energy for lighting	447.6609	28.6600	128.2996	(250)
Additional standing charges			107.0000	(251)
Energy saving/generation technologies				
PV Unit	-988.8570	28.6600	-283.4064	(252)
Total energy cost			366.7081	(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	4310.7366	0.2160	931.1191	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	824.6278	0.2160	178.1196	(264)
Space and water heating			1109.2387	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	447.6609	0.5190	232.3360	(268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit	-988.8570	0.5190	-513.2168 (269)
Total kg/year			893.2330 (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	4310.7366	1.2200	5259.0987 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	824.6278	1.2200	1006.0460 (264)
Space and water heating			6265.1446 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	447.6609	3.0700	1374.3191 (268)
Energy saving/generation technologies			
PV Unit	-988.8570	3.0700	-3035.7910 (269)
Primary energy kWh/year			4987.4227 (272)
Primary energy kWh/m2/year			46.1627 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 12	Issued on Date	06/08/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Project	25, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	14.53	TER	18.73
Environmental	88 B	% DER<TER	22.43		
CO ₂ Emissions (t/year)	1.10	DFEE	54.03	TFEE	61.58
General Requirements Compliance	Pass	% DFEE<TFEE	12.26		

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 12	Issued on Date	06/08/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Project	25, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	14.53	TER	18.73
Environmental	88 B	% DER<TER	22.43		
CO ₂ Emissions (t/year)	1.10	DFEE	54.03	TFEE	61.58
General Requirements Compliance	Pass	% DFEE<TFEE	12.26		

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 12	Issued on Date	06/08/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Project	25, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	14.53	TER	18.73
Environmental	88 B	% DER<TER	22.43		
CO ₂ Emissions (t/year)	1.10	DFEE	54.03	TFEE	61.58
General Requirements Compliance	Pass	% DFEE<TFEE	12.26		

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 12	Issued on Date	06/08/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Project	25, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	14.53	TER	18.73
Environmental	88 B	% DER<TER	22.43		
CO ₂ Emissions (t/year)	1.10	DFEE	54.03	TFEE	61.58
General Requirements Compliance	Pass	% DFEE<TFEE	12.26		

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 12	Issued on Date	06/08/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Project	25, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	14.53	TER	18.73
Environmental	88 B	% DER<TER	22.43		
CO ₂ Emissions (t/year)	1.10	DFEE	54.03	TFEE	61.58
General Requirements Compliance	Pass	% DFEE<TFEE	12.26		

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 12	Issued on Date	06/08/2024
Assessment Reference	As Built	Prop Type Ref	Type A
Property	25, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	14.53
Environmental	88 B	TER	18.73
CO ₂ Emissions (t/year)	1.10	% DER<TER	22.43
General Requirements Compliance	Pass	DFEE	54.03
		TFEE	61.58
		% DFEE<TFEE	12.26
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:	27.81 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	160.02	kJ/m²K

9.0 External Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	140.14	121.86
Wall to Garage	Cavity Wall	Other	0.24	42.22	14.36	12.60

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

9.2 Internal Walls				
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)
Ground Floor Stud	Plasterboard on timber frame		9.00	29.91
Ground Floor Block	Dense block, plasterboard on dabs		75.00	50.22
First Floor Stud	Plasterboard on timber frame		9.00	146.48

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

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

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)	27.81	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	21.78	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	23.57	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	0.068	W/m²K
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18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	3.95	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation	
Summer Overheating	
Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	4.00
Mechanical Ventilation	
Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues				
	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No
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22.0 Lighting	
Internal	
Total number of light fittings	25
Total number of L.E.L. fittings	25
Percentage of L.E.L. fittings	100.00 %
External	
External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff	Standard
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24.0 Main Heating 1	Database
Description	Gas Combi

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	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
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.20	West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£66	B 89	