



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 16 Shaw Crescent, West End
SOUTHAMPTON, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 08/01/2025

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 21	Issued on Date	08/01/2025
Assessment Reference	As Built	Prop Type Ref	Type F
Property	16 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH		
SAP Rating	88 B	DER	12.67
Environmental	90 B	TER	17.90
CO ₂ Emissions (t/year)	0.74	% DER<TER	29.20
General Requirements Compliance	Pass	DLEE	43.86
		TFEE	50.95
		% DLEE<TFEE	13.91
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 TLEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.90	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.67	kgCO ₂ /m ²	Pass
	-5.23 (-29.2%)	kgCO ₂ /m ²	

1b TLEE and DLEE

Target Fabric Energy Efficiency (TLEE)	50.95	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DLEE)	43.86	kWh/m ² /yr	
	-7.0 (-13.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.37 (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

Continuous extract system

Specific fan power

0.17

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

5.80 m², No overhang

Windows facing East

1.91 m², No overhang

Windows facing South

7.82 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.37 (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	3.4	m ³ /m ² h
Photovoltaic array	0.82	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 21	Issued on Date	08/01/2025
Assessment Reference	As Built	Prop Type Ref	Type F
Property	16 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH		

SAP Rating	88 B	DER	12.67	TER	17.90
Environmental	90 B	% DER<TER	29.20		
CO ₂ Emissions (t/year)	0.74	DFEE	43.86	TFEE	50.95
General Requirements Compliance	Pass	% DFEE<TFEE	13.91		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	2.84	0.20	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	8.74	0.56	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	10.56	0.22	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	29.10	0.47	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	20.08	6.43	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	20.08	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	14.16	0.85	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	6.02	0.26	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.00	0.39	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.00	0.36	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	6.02	0.96	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	6.02	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	6.02	0.21	Knauf P29 Halved

Total: **11.02** W/mK:
Y-Value: **0.060** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	90 B	% DER<TER	29.20		
CO ₂ Emissions (t/year)	0.74	DFEE	43.86	TFEE	50.95
General Requirements Compliance	Pass	% DFEE<TFEE	13.91		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS BUILT

Semi-Detached House, total floor area 85 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.90 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.67 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 43.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.37 (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

Continuous extract system

Specific fan power: 0.17
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing North: 5.80 m², No overhang

Windows facing East: 1.91 m², No overhang

Windows facing South: 7.82 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Air permeability 3.4 m³/m²h

Photovoltaic array 0.82 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.3500 (1b)	x 2.3900 (2b)	= 101.2165 (1b) - (3b)
First floor	42.3500 (1c)	x 2.6100 (2c)	= 110.5335 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.3700
Infiltration rate					0.1685 (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) =	0.1432 (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	0.1826	0.1790	0.1755	0.1575	0.1540	0.1361	0.1361	0.1325	0.1432	0.1540	0.1611	0.1683 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)
Ground Floor			42.3500	0.1200	5.0820	84.0000	3557.4000 (28a)
Brick and Block	100.4000	17.6800	82.7200	0.2400	19.8528	42.2200	3492.4384 (29a)
Pitched Roof	42.3500		42.3500	0.1000	4.2350	9.1000	385.3850 (30)
Total net area of external elements Aum(A, m ²)			185.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.3172		(33)
Party Wall 1			30.1000	0.0000	0.0000	110.0000	3311.0000 (32)
Ground Floor Block			28.7200			75.0000	2154.0000 (32c)
Ground Floor Stud			47.0300			9.0000	423.2700 (32c)
First Floor Stud			103.6500			9.0000	932.8500 (32c)
Internal Floor 1			42.3500			18.0000	762.3000 (32d)
Internal Ceiling 1			42.3500			18.0000	762.3000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15780.9434 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 186.3157 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.0189 (36)
Total fabric heat loss (33) + (36) = 60.3361 (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	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388 (38)
Heat transfer coeff	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749 (39)
Average = Sum(39)m / 12 =												95.2749 (39)
HLP	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249 (40)
HLP (average)												1.1249 (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												2.5460 (42)
Average daily hot water use (litres/day)												94.6679 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use	104.1347	100.3480	96.5613	92.7746	88.9878	85.2011	85.2011	88.9878	92.7746	96.5613	100.3480	104.1347 (44)
Energy conte	154.4288	135.0644	139.3744	121.5099	116.5917	100.6098	93.2297	106.9825	108.2602	126.1668	137.7209	149.5560 (45)
Energy content (annual)										Total = Sum (45)m =		1489.4950 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1643	20.2597	20.9062	18.2265	17.4888	15.0915	13.9845	16.0474	16.2390	18.9250	20.6581	22.4334 (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	0.6706	0.6070	0.6056	0.5073	0.4669	0.3857	0.3574	0.4284	0.4520	0.5482	0.6189	0.6495 (61)
Total heat required for water heating calculated for each month	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (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	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (64)
Heat gains from water heating, kWh/month	51.5152	45.0607	46.4934	40.5289	38.8835	33.5492	31.0882	35.6788	36.1095	42.0875	45.9469	49.8897 (65)
										Total per year (kWh/year) = Sum (64)m =		1495.7926 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7901	18.4656	15.0172	11.3690	8.4985	7.1748	7.7526	10.0771	13.5255	17.1737	20.0442	21.3679 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.9828	231.3589	225.3711	212.6239	196.5328	181.4095	171.3061	168.9300	174.9178	187.6650	203.7561	218.8794 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301 (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)	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407 (71)
Water heating gains (Table 5)	69.2409	67.0545	62.4911	56.2901	52.2627	46.5961	41.7853	47.9553	50.1521	56.5692	63.8152	67.0561 (72)
Total internal gains	383.2040	381.0693	367.0697	344.4733	321.4843	299.3706	285.0343	291.1527	302.7856	325.5982	351.8058	371.4937 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				5.8000	10.6334	0.6300	0.7000	0.7700		18.8483 (74)		
East				1.9100	19.6403	0.6300	0.7000	0.7700		11.4644 (76)		
South				7.8200	46.7521	0.6300	0.7000	0.7700		111.7325 (78)		

Solar gains	142.0452	241.4359	331.2362	415.6282	472.9820	473.5536	454.8421	410.9685	360.0418	266.8593	169.9876	121.6878 (83)
Total gains	525.2492	622.5052	698.3059	760.1015	794.4662	772.9242	739.8763	702.1212	662.8274	592.4575	521.7934	493.1815 (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	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100
alpha	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673
util living area	0.9926	0.9847	0.9682	0.9288	0.8438	0.6981	0.5408	0.5862	0.7993	0.9464	0.9862	0.9942 (86)
MIT	19.5062	19.7140	20.0150	20.3760	20.6989	20.9020	20.9733	20.9628	20.8219	20.3993	19.8693	19.4496 (87)
Th 2	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806 (88)
util rest of house	0.9907	0.9808	0.9599	0.9092	0.7998	0.6152	0.4269	0.4723	0.7301	0.9277	0.9820	0.9928 (89)
MIT 2	18.6211	18.8268	19.1231	19.4715	19.7663	19.9287	19.9718	19.9672	19.8740	19.5000	18.9825	18.5648 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	18.8236	19.0298	19.3272	19.6784	19.9796	20.1514	20.2010	20.1950	20.0909	19.7058	19.1854	18.7672 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8236	19.0298	19.3272	19.6784	19.9796	20.1514	20.2010	20.1950	20.0909	19.7058	19.1854	18.7672 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9878	0.9762	0.9533	0.9023	0.7998	0.6302	0.4526	0.4976	0.7386	0.9214	0.9777	0.9904 (94)
Ext temp.	518.8638	607.6815	665.6671	685.8452	635.4111	487.1071	334.8379	349.3529	489.5526	545.8939	510.1739	488.4283 (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	1383.7325	1346.2172	1222.1071	1026.9123	788.8424	528.9121	343.0835	361.5705	570.7815	867.5547	1151.4316	1387.8915 (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	643.4623	496.2960	413.9914	245.5683	114.1529	0.0000	0.0000	0.0000	0.0000	239.3157	461.7056	669.2006 (98)
Space heating per m2												3283.6928 (98)
										(98) / (4) =		38.7685 (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	3640.4576 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	643.4623	496.2960	413.9914	245.5683	114.1529	0.0000	0.0000	0.0000	0.0000	239.3157	461.7056	669.2006 (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)	713.3729	550.2173	458.9705	272.2487	126.5553	0.0000	0.0000	0.0000	0.0000	265.3167	511.8687	741.9075 (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	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (64)
Efficiency of water heater (217)m	87.1428	86.8328	86.2628	85.0977	82.6424	76.4000	76.4000	76.4000	76.4000	84.8916	86.5939	76.4000 (216)
Fuel for water heating, kWh/month	177.9830	156.2443	162.2715	143.3849	141.6446	132.1931	122.4963	140.5902	142.2934	149.2668	159.7570	172.0387 (219)
Water heating fuel used												1800.1638 (219)
Annual totals kWh/year												3640.4576 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)												
mechanical ventilation fans (SFP = 0.2380)												61.4837 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												136.4837 (231)
Electricity for lighting (calculated in Appendix L)												367.1600 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.82 * 1068 * 1.00) =											-700.6542	-700.6542 (233)
Total delivered energy for all uses												5243.6109 (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	3640.4576	0.2160	786.3388 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1800.1638	0.2160	388.8354 (264)
Space and water heating			1175.1742 (265)
Pumps and fans	136.4837	0.5190	70.8351 (267)
Energy for lighting	367.1600	0.5190	190.5560 (268)
Energy saving/generation technologies			
PV Unit	-700.6542	0.5190	-363.6395 (269)
Total CO2, kg/year			1072.9258 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.6700 (273)

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

DER		12.6700 ZC1
Total Floor Area	TFA	84.7000
Assumed number of occupants	N	2.5460
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.0201 ZC2
CO2 emissions from cooking, equation (L16)		2.1264 ZC3
Total CO2 emissions		30.8165 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		30.8165 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	42.3500 (1b)	x 2.3900 (2b)	= 101.2165 (1b) - (3b)
First floor	42.3500 (1c)	x 2.6100 (2c)	= 110.5335 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1417 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3917 (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) =	0.3329 (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	0.4245	0.4162	0.4078	0.3662	0.3579	0.3163	0.3163	0.3080	0.3329	0.3579	0.3745	0.3912 (22b)
Effective ac	0.5901	0.5866	0.5832	0.5671	0.5640	0.5500	0.5500	0.5474	0.5554	0.5640	0.5701	0.5765 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			15.5300	1.3258	20.5890		(27)					
Ground Floor			42.3500	0.1300	5.5055		(28a)					
Brick and Block	100.4000	17.6800	82.7200	0.1800	14.8896		(29a)					
Pitched Roof	42.3500		42.3500	0.1300	5.5055		(30)					
Total net area of external elements Aum(A, m2)			185.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6396		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.7691 (36)					
Total fabric heat loss						(33) + (36) =	58.4087 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.2341	Feb 40.9897	Mar 40.7500	Apr 39.6246	May 39.4140	Jun 38.4338	Jul 38.4338	Aug 38.2522	Sep 38.8113	Oct 39.4140	Nov 39.8400	Dec 40.2853 (38)
Heat transfer coeff	99.6428	99.3984	99.1588	98.0333	97.8227	96.8425	96.8425	96.6609	97.2200	97.8227	98.2487	98.6940 (39)
Average = Sum(39)m / 12 =												98.0323 (39)
HLP	Jan 1.1764	Feb 1.1735	Mar 1.1707	Apr 1.1574	May 1.1549	Jun 1.1434	Jul 1.1434	Aug 1.1412	Sep 1.1478	Oct 1.1549	Nov 1.1600	Dec 1.1652 (40)
HLP (average)												1.1574 (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												2.5460 (42)
Average daily hot water use (litres/day)												94.6679 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.1347	100.3480	96.5613	92.7746	88.9878	85.2011	85.2011	88.9878	92.7746	96.5613	100.3480	104.1347 (44)
Energy conte	154.4288	135.0644	139.3744	121.5099	116.5917	100.6098	93.2297	106.9825	108.2602	126.1668	137.7209	149.5560 (45)
Energy content (annual)											Total = Sum(45)m =	1489.4950 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.1643	20.2597	20.9062	18.2265	17.4888	15.0915	13.9845	16.0474	16.2390	18.9250	20.6581	22.4334 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.2066	45.7518	45.3472	42.0170	43.4176	45.3472	45.7518	49.2066	49.3151	50.9589 (61)
Solar input	205.3877	181.0918	188.5809	167.2618	161.9389	142.6267	136.6473	152.3297	154.0120	175.3734	187.0360	200.5149 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	205.3877	181.0918	188.5809	167.2618	161.9389	142.6267	136.6473	152.3297	154.0120	175.3734	187.0360	200.5149 (64)
Heat gains from water heating, kWh/month	64.0873	56.4158	58.6436	51.8400	50.1035	43.9570	41.8533	46.9085	47.4345	54.2521	58.1210	62.4671 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7901	18.4656	15.0172	11.3690	8.4985	7.1748	7.7526	10.0771	13.5255	17.1737	20.0442	21.3679	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.9828	231.3589	225.3711	212.6239	196.5328	181.4095	171.3061	168.9300	174.9178	187.6650	203.7561	218.8794	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	(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)	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	(71)
Water heating gains (Table 5)	86.1388	83.9520	78.8221	72.0000	67.3435	61.0514	56.2544	63.0490	65.8812	72.9195	80.7236	83.9612	(72)
Total internal gains	400.1020	397.9668	383.4007	360.1832	336.5650	313.8259	299.5034	306.2464	318.5147	341.9485	368.7142	388.3988	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					5.8000	10.6334	0.6300	0.7000			0.7700			18.8483 (74)
East					1.9100	19.6403	0.6300	0.7000			0.7700			11.4644 (76)
South					7.8200	46.7521	0.6300	0.7000			0.7700			111.7325 (78)
Solar gains	142.0452	241.4359	331.2362	415.6282	472.9820	473.5536	454.8421	410.9685	360.0418	266.8593	169.9876	121.6878	(83)	
Total gains	542.1472	639.4026	714.6369	775.8114	809.5470	787.3795	754.3455	717.2149	678.5565	608.8077	538.7018	510.0866	(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	59.0303	59.1755	59.3185	59.9995	60.1286	60.7372	60.7372	60.8513	60.5014	60.1286	59.8679	59.5978	
alpha	4.9354	4.9450	4.9546	5.0000	5.0086	5.0491	5.0491	5.0568	5.0334	5.0086	4.9912	4.9732	
util living area	0.9973	0.9935	0.9840	0.9551	0.8782	0.7217	0.5507	0.5977	0.8294	0.9678	0.9941	0.9980	(86)
MIT	19.7604	19.9345	20.1885	20.5070	20.7797	20.9428	20.9881	20.9823	20.8802	20.5257	20.0812	19.7295	(87)
Th 2	19.9389	19.9412	19.9435	19.9542	19.9562	19.9656	19.9656	19.9673	19.9620	19.9562	19.9522	19.9479	(88)
util rest of house	0.9964	0.9914	0.9783	0.9383	0.8326	0.6300	0.4285	0.4746	0.7541	0.9524	0.9918	0.9974	(89)
MIT 2	18.2934	18.5486	18.9179	19.3772	19.7394	19.9272	19.9612	19.9601	19.8674	19.4120	18.7713	18.2547	(90)
Living area fraction									fLA = Living area / (4) =			0.2288	(91)
MIT	18.6291	18.8657	19.2087	19.6357	19.9774	20.1596	20.1962	20.1940	20.0991	19.6668	19.0710	18.5922	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6291	18.8657	19.2087	19.6357	19.9774	20.1596	20.1962	20.1940	20.0991	19.6668	19.0710	18.5922	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9948	0.9882	0.9730	0.9319	0.8337	0.6485	0.4566	0.5028	0.7654	0.9468	0.9889	0.9961	(94)
Ext temp.	539.3122	631.8657	695.3604	722.9442	674.8881	510.6405	344.4407	360.5915	519.3713	576.4352	532.7202	508.0754	(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	1427.7911	1388.1698	1260.1750	1052.4584	809.7223	538.4066	348.2619	366.7268	583.2336	886.9437	1176.1394	1420.4225	(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	661.0283	508.2364	420.2220	237.2502	100.3166	0.0000	0.0000	0.0000	0.0000	231.0183	463.2618	678.7862	(98)
Space heating per m2												3300.1199	(98)
										(98) / (4) =		38.9625	(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													3533.3190 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	661.0283	508.2364	420.2220	237.2502	100.3166	0.0000	0.0000	0.0000	0.0000	231.0183	463.2618	678.7862	(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)	707.7391	544.1503	449.9165	254.0152	107.4054	0.0000	0.0000	0.0000	0.0000	247.3430	495.9977	726.7518	(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	205.3877	181.0918	188.5809	167.2618	161.9389	142.6267	136.6473	152.3297	154.0120	175.3734	187.0360	200.5149	(64)
Efficiency of water heater (217)m	87.7826	87.5085	87.0100	85.9309	83.8850	80.3000	80.3000	80.3000	80.3000	85.7459	87.2439	80.3000	(216)
Fuel for water heating, kWh/month	233.9730	206.9420	216.7347	194.6468	193.0488	177.6174	170.1710	189.7008	191.7958	204.5269	214.3830	228.1705	(219)
Water heating fuel used												2421.7106	(219)
Annual totals kWh/year													
Space heating fuel - main system												3533.3190	(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)												367.1600	(232)
Total delivered energy for all uses												6397.1895	(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	3533.3190	0.2160	763.1969 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2421.7106	0.2160	523.0895 (264)
Space and water heating			1286.2864 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	367.1600	0.5190	190.5560 (268)
Total CO2, kg/m2/year			1515.7674 (272)
Emissions per m2 for space and water heating			15.1864 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2498 (272b)
Emissions per m2 for pumps and fans			0.4596 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.1864 * 1.00) + 2.2498 + 0.4596, rounded to 2 d.p.			17.9000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.3500 (1b)	x 2.3900 (2b)	= 101.2165 (1b) - (3b)
First floor	42.3500 (1c)	x 2.6100 (2c)	= 110.5335 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1417 (8)
Pressure test					Yes
Measured/design AP50					3.3700
Infiltration rate					0.3102 (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) =	0.2637 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3362	0.3296	0.3230	0.2900	0.2834	0.2505	0.2505	0.2439	0.2637	0.2834	0.2966	0.3098 (22b)
	0.5565	0.5543	0.5522	0.5421	0.5402	0.5314	0.5314	0.5297	0.5348	0.5402	0.5440	0.5480 (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)			15.5300	1.1450	17.7824		(27)
Ground Floor			42.3500	0.1200	5.0820	84.0000	3557.4000 (28a)
Brick and Block	100.4000	17.6800	82.7200	0.2400	19.8528	42.2200	3492.4384 (29a)
Pitched Roof	42.3500		42.3500	0.1000	4.2350	9.1000	385.3850 (30)
Total net area of external elements Aum(A, m ²)			185.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.3172		(33)
Party Wall 1			30.1000	0.0000	0.0000	110.0000	3311.0000 (32)
Ground Floor Block			28.7200			75.0000	2154.0000 (32c)
Ground Floor Stud			47.0300			9.0000	423.2700 (32c)
First Floor Stud			103.6500			9.0000	932.8500 (32c)
Internal Floor 1			42.3500			18.0000	762.3000 (32d)
Internal Ceiling 1			42.3500			9.0000	381.1500 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 15399.7934 (34)
181.8157 (35)
11.0189 (36)
(33) + (36) = 60.3361 (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	38.8868	38.7335	38.5832	37.8774	37.7453	37.1306	37.1306	37.0168	37.3674	37.7453	38.0125	38.2918 (38)
Heat transfer coeff	99.2229	99.0696	98.9193	98.2135	98.0815	97.4667	97.4667	97.3529	97.7035	98.0815	98.3486	98.6279 (39)
Average = Sum(39)m / 12 =												98.2129 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1715	1.1697	1.1679	1.1595	1.1580	1.1507	1.1507	1.1494	1.1535	1.1580	1.1611	1.1644 (40)
HLP (average)												1.1595 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.5460 (42)
94.6679 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.1347	100.3480	96.5613	92.7746	88.9878	85.2011	85.2011	88.9878	92.7746	96.5613	100.3480	104.1347 (44)
Energy conte	154.4288	135.0644	139.3744	121.5099	116.5917	100.6098	93.2297	106.9825	108.2602	126.1668	137.7209	149.5560 (45)

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Energy content (annual)	Total = Sum(45)m = 1489.4950 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.8161	28.7012	29.6171	25.8209	24.7757	21.3796	19.8113	22.7338	23.0053	26.8104	29.2657	31.7807 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7901	18.4656	15.0172	11.3690	8.4985	7.1748	7.7526	10.0771	13.5255	17.1737	20.0442	21.3679	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.9828	231.3589	225.3711	212.6239	196.5328	181.4095	171.3061	168.9300	174.9178	187.6650	203.7561	218.8794	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	(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)	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	(71)
Water heating gains (Table 5)	44.1077	42.7101	39.8079	35.8623	33.3007	29.6939	26.6281	30.5562	31.9518	36.0355	40.6468	42.7159	(72)
Total internal gains	355.0708	353.7248	341.3865	321.0455	299.5223	279.4684	266.8771	270.7535	281.5853	302.0645	325.6374	344.1536	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					5.8000	10.6334	0.6300	0.7000			0.7700			18.8483 (74)
East					1.9100	19.6403	0.6300	0.7000			0.7700			11.4644 (76)
South					7.8200	46.7521	0.6300	0.7000			0.7700			111.7325 (78)
Solar gains	142.0452	241.4359	331.2362	415.6282	472.9820	473.5536	454.8421	410.9685	360.0418	266.8593	169.9876	121.6878	(83)	
Total gains	497.1160	595.1607	672.6227	736.6737	772.5043	753.0220	721.7192	681.7220	641.6271	568.9238	495.6250	465.8414	(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	43.1122	43.1789	43.2445	43.5553	43.6140	43.8890	43.8890	43.9404	43.7827	43.6140	43.4955	43.3723	
alpha	3.8741	3.8786	3.8830	3.9037	3.9076	3.9259	3.9259	3.9294	3.9188	3.9076	3.8997	3.8915	
util living area	0.9934	0.9862	0.9712	0.9350	0.8566	0.7161	0.5604	0.6074	0.8159	0.9521	0.9877	0.9948	(86)
MIT	19.3639	19.5815	19.9005	20.2953	20.6466	20.8805	20.9655	20.9523	20.7872	20.3250	19.7628	19.3185	(87)
Th 2	19.9429	19.9444	19.9458	19.9525	19.9538	19.9596	19.9596	19.9607	19.9574	19.9538	19.9512	19.9486	(88)
util rest of house	0.9917	0.9827	0.9637	0.9168	0.8144	0.6332	0.4423	0.4903	0.7488	0.9351	0.9840	0.9935	(89)
MIT 2	18.4531	18.6701	18.9859	19.3740	19.6992	19.8952	19.9480	19.9432	19.8277	19.4099	18.8568	18.4123	(90)
Living area fraction	18.6615	18.8786	19.1952	19.5848	19.9160	20.1206	20.1808	20.1741	20.0472	19.6193	19.0641	18.6196	(92)
MIT	18.6615	18.8786	19.1952	19.5848	19.9160	20.1206	20.1808	20.1741	20.0472	19.6193	19.0641	18.6196	(93)
Temperature adjustment	18.6615	18.8786	19.1952	19.5848	19.9160	20.1206	20.1808	20.1741	20.0472	19.6193	19.0641	18.6196	(93)
adjusted MIT	18.6615	18.8786	19.1952	19.5848	19.9160	20.1206	20.1808	20.1741	20.0472	19.6193	19.0641	18.6196	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	491.6099	582.1216	643.5897	669.6981	627.8136	487.3349	338.3111	351.7429	484.7094	528.0612	485.6325	461.7536	(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	1424.9918	1384.8559	1255.7973	1049.3964	805.8382	538.0763	349.0111	367.4182	581.0644	884.6247	1176.6551	1422.1791	(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	694.4361	539.4374	455.4825	273.3827	132.4503	0.0000	0.0000	0.0000	0.0000	265.2832	497.5363	714.5565	(98)
Space heating												3572.5651	(98)
Space heating per m2												42.1790	(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	916.1871	721.2537	739.8818	0.0000	0.0000	0.0000	0.0000	(100)

FULL SAP CALCULATION PRINTOUT

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8212	0.8863	0.8641	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	752.4169	639.2178	639.3676	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	975.6379	937.0664	891.9785	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	160.7191	221.5994	187.9425	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												570.2610 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	40.1798	55.3998	46.9856	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												142.5653 (107)
Space cooling per m2												1.6832 (108)
Energy for space heating												42.1790 (99)
Energy for space cooling												1.6832 (108)
Total												43.8622 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.3500 (1b)	x 2.3900 (2b)	= 101.2165 (1b) - (3b)
First floor	42.3500 (1c)	x 2.6100 (2c)	= 110.5335 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1417 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3917 (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) =	0.3329 (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	0.4245	0.4162	0.4078	0.3662	0.3579	0.3163	0.3163	0.3080	0.3329	0.3579	0.3745	0.3912 (22b)
Effective ac	0.5901	0.5866	0.5832	0.5671	0.5640	0.5500	0.5500	0.5474	0.5554	0.5640	0.5701	0.5765 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			15.5300	1.3258	20.5890		(27)
Ground Floor			42.3500	0.1300	5.5055		(28a)
Brick and Block	100.4000	17.6800	82.7200	0.1800	14.8896		(29a)
Pitched Roof	42.3500		42.3500	0.1300	5.5055		(30)
Total net area of external elements Aum(A, m ²)			185.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6396		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.7691 (36)
Total fabric heat loss						(33) + (36) =	58.4087 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.2341	40.9897	40.7500	39.6246	39.4140	38.4338	38.4338	38.2522	38.8113	39.4140	39.8400	40.2853 (38)
Heat transfer coeff	99.6428	99.3984	99.1588	98.0333	97.8227	96.8425	96.8425	96.6609	97.2200	97.8227	98.2487	98.6940 (39)
Average = Sum(39)m / 12 =												98.0323 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1764	1.1735	1.1707	1.1574	1.1549	1.1434	1.1434	1.1412	1.1478	1.1549	1.1600	1.1652 (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												2.5460 (42)
Average daily hot water use (litres/day)												94.6679 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.1347	100.3480	96.5613	92.7746	88.9878	85.2011	85.2011	88.9878	92.7746	96.5613	100.3480	104.1347 (44)
Energy conte	154.4288	135.0644	139.3744	121.5099	116.5917	100.6098	93.2297	106.9825	108.2602	126.1668	137.7209	149.5560 (45)
Energy content (annual)										Total = Sum(45)m =		1489.4950 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.8161	28.7012	29.6171	25.8209	24.7757	21.3796	19.8113	22.7338	23.0053	26.8104	29.2657	31.7807 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	127.3009	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7901	18.4656	15.0172	11.3690	8.4985	7.1748	7.7526	10.0771	13.5255	17.1737	20.0442	21.3679	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.9828	231.3589	225.3711	212.6239	196.5328	181.4095	171.3061	168.9300	174.9178	187.6650	203.7561	218.8794	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	35.7301	(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)	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	(71)
Water heating gains (Table 5)	44.1077	42.7101	39.8079	35.8623	33.3007	29.6939	26.6281	30.5562	31.9518	36.0355	40.6468	42.7159	(72)
Total internal gains	355.0708	353.7248	341.3865	321.0455	299.5223	279.4684	266.8771	270.7535	281.5853	302.0645	325.6374	344.1536	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W		
North				5.8000	10.6334	0.6300		0.7000		0.7700	18.8483 (74)		
East				1.9100	19.6403	0.6300		0.7000		0.7700	11.4644 (76)		
South				7.8200	46.7521	0.6300		0.7000		0.7700	111.7325 (78)		
Solar gains	142.0452	241.4359	331.2362	415.6282	472.9820	473.5536	454.8421	410.9685	360.0418	266.8593	169.9876	121.6878	(83)
Total gains	497.1160	595.1607	672.6227	736.6737	772.5043	753.0220	721.7192	681.7220	641.6271	568.9238	495.6250	465.8414	(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	59.0303	59.1755	59.3185	59.9995	60.1286	60.7372	60.7372	60.8513	60.5014	60.1286	59.8679	59.5978	
alpha	4.9354	4.9450	4.9546	5.0000	5.0086	5.0491	5.0491	5.0568	5.0334	5.0086	4.9912	4.9732	
util living area	0.9982	0.9953	0.9875	0.9629	0.8937	0.7443	0.5728	0.6240	0.8522	0.9753	0.9959	0.9987	(86)
MIT	19.7113	19.8871	20.1455	20.4719	20.7570	20.9342	20.9859	20.9786	20.8625	20.4876	20.0348	19.6810	(87)
Th 2	19.9389	19.9412	19.9435	19.9542	19.9562	19.9656	19.9656	19.9673	19.9620	19.9562	19.9522	19.9479	(88)
util rest of house	0.9976	0.9936	0.9830	0.9484	0.8515	0.6533	0.4471	0.4977	0.7812	0.9629	0.9943	0.9982	(89)
MIT 2	18.7666	18.9435	19.2013	19.5279	19.7902	19.9349	19.9620	19.9612	19.8858	19.5492	19.1000	18.7435	(90)
Living area fraction									fLA = Living area / (4) =			0.2288	(91)
MIT	18.9827	19.1594	19.4174	19.7439	20.0114	20.1635	20.1962	20.1940	20.1093	19.7639	19.3139	18.9581	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9827	19.1594	19.4174	19.7439	20.0114	20.1635	20.1962	20.1940	20.1093	19.7639	19.3139	18.9581	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9968	0.9920	0.9800	0.9448	0.8541	0.6722	0.4762	0.5269	0.7929	0.9599	0.9929	0.9977	(94)
Useful gains	495.5194	590.4060	659.1991	696.0285	659.8274	506.2108	343.6636	359.1836	508.7199	546.1219	492.0835	464.7469	(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	1463.0285	1417.3606	1280.8704	1063.0634	813.0482	538.7840	348.2691	366.7299	584.2222	896.4373	1200.0004	1456.5322	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	719.8267	555.7135	462.5235	264.2651	113.9963	0.0000	0.0000	0.0000	0.0000	260.6347	509.7002	737.8882	(98)
Space heating												3624.5483	(98)
Space heating per m2										(98) / (4) =		42.7928	(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	910.3192	716.6343	734.6231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8622	0.9243	0.9044	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	784.8797	662.4046	664.3699	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	975.6379	937.0664	891.9785	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	137.3459	204.3484	169.3408	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												511.0351	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.3365	51.0871	42.3352	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												127.7588 (107)
Space cooling per m2												1.5084 (108)
Energy for space heating												42.7928 (99)
Energy for space cooling												1.5084 (108)
Total												44.3011 (109)
Target Fabric Energy Efficiency (TFEE)												50.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.3500 (1b)	x 2.3900 (2b)	= 101.2165 (1b) - (3b)
First floor	42.3500 (1c)	x 2.6100 (2c)	= 110.5335 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7500 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												3.3700
Infiltration rate												0.1685 (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) =	0.1432 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1683	0.1575	0.1575	0.1432	0.1468	0.1396	0.1396	0.1361	0.1361	0.1468	0.1432	0.1468 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.3500	0.1200	5.0820	84.0000	3557.4000 (28a)					
Brick and Block	100.4000	17.6800	82.7200	0.2400	19.8528	42.2200	3492.4384 (29a)					
Pitched Roof	42.3500		42.3500	0.1000	4.2350	9.1000	385.3850 (30)					
Total net area of external elements Aum(A, m2)			185.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.3172			(33)					
Party Wall 1			30.1000	0.0000	0.0000	110.0000	3311.0000 (32)					
Ground Floor Block			28.7200			75.0000	2154.0000 (32c)					
Ground Floor Stud			47.0300			9.0000	423.2700 (32c)					
First Floor Stud			103.6500			9.0000	932.8500 (32c)					
Internal Floor 1			42.3500			18.0000	762.3000 (32d)					
Internal Ceiling 1			42.3500			18.0000	762.3000 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		15780.9434 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.3157 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0189 (36)					
Total fabric heat loss						(33) + (36) =	60.3361 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9388	Feb 34.9388	Mar 34.9388	Apr 34.9388	May 34.9388	Jun 34.9388	Jul 34.9388	Aug 34.9388	Sep 34.9388	Oct 34.9388	Nov 34.9388	Dec 34.9388 (38)
Heat transfer coeff	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749 (39)
Average = Sum(39)m / 12 =												95.2749 (39)
HLP	Jan 1.1249	Feb 1.1249	Mar 1.1249	Apr 1.1249	May 1.1249	Jun 1.1249	Jul 1.1249	Aug 1.1249	Sep 1.1249	Oct 1.1249	Nov 1.1249	Dec 1.1249 (40)
HLP (average)												1.1249 (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												2.5460 (42)
Average daily hot water use (litres/day)												94.6679 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Daily hot water use	104.1347	100.3480	96.5613	92.7746	88.9878	85.2011	85.2011	88.9878	92.7746	96.5613	100.3480	104.1347 (44)
Energy conte	154.4288	135.0644	139.3744	121.5099	116.5917	100.6098	93.2297	106.9825	108.2602	126.1668	137.7209	149.5560 (45)
Energy content (annual)										Total =	Sum (45)m =	1489.4950 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1643	20.2597	20.9062	18.2265	17.4888	15.0915	13.9845	16.0474	16.2390	18.9250	20.6581	22.4334 (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	0.6706	0.6070	0.6056	0.5073	0.4669	0.3857	0.3574	0.4284	0.4520	0.5482	0.6189	0.6495 (61)
Total heat required for water heating calculated for each month	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (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	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (64)
RHI water heating demand												1496 (64)
Heat gains from water heating, kWh/month	51.5152	45.0607	46.4934	40.5289	38.8835	33.5492	31.0882	35.6788	36.1095	42.0875	45.9469	49.8897 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9753	46.1640	37.5431	28.4225	21.2462	17.9369	19.3815	25.1928	33.8137	42.9342	50.1106	53.4198 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.7653	345.3118	336.3748	317.3491	293.3326	270.7604	255.6808	252.1344	261.0713	280.0970	304.1136	326.6857 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221 (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)	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407 (71)
Water heating gains (Table 5)	69.2409	67.0545	62.4911	56.2901	52.2627	46.5961	41.7853	47.9553	50.1521	56.5692	63.8152	67.0561 (72)
Total internal gains	569.7240	565.2728	543.1515	508.8042	473.5839	442.0359	423.5900	432.0249	451.7796	486.3430	524.7818	553.9042 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	5.8000	13.4684	0.6300	0.7000	0.7700	23.8735 (74)
East	1.9100	25.1733	0.6300	0.7000	0.7700	14.6942 (76)
South	7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)

Solar gains	173.8027	251.5840	352.6872	447.7284	482.8499	536.5366	494.4986	463.5373	402.4065	300.3373	207.3195	140.9583 (83)
Total gains	743.5267	816.8568	895.8387	956.5326	956.4338	978.5725	918.0886	895.5623	854.1860	786.6803	732.1014	694.8624 (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	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100
alpha	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673
util living area	0.9679	0.9532	0.9153	0.8342	0.6970	0.4816	0.3396	0.3376	0.5865	0.8315	0.9404	0.9737 (86)
MIT	19.9561	20.0917	20.3623	20.6641	20.8798	20.9796	20.9963	20.9965	20.9546	20.7294	20.3117	19.9092 (87)
Th 2	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806 (88)
util rest of house	0.9601	0.9422	0.8955	0.7962	0.6310	0.3916	0.2362	0.2315	0.4941	0.7835	0.9238	0.9671 (89)
MIT 2	19.0642	19.1953	19.4537	19.7295	19.9079	19.9729	19.9799	19.9800	19.9605	19.7928	19.4109	19.0190 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	19.2683	19.4004	19.6616	19.9434	20.1303	20.2032	20.2125	20.2126	20.1880	20.0071	19.6170	19.2227 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2683	19.4004	19.6616	19.9434	20.1303	20.2032	20.2125	20.2126	20.1880	20.0071	19.6170	19.2227 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9534	0.9346	0.8883	0.7947	0.6413	0.4118	0.2599	0.2559	0.5138	0.7849	0.9167	0.9609 (94)
Ext temp.	708.8553	763.4584	795.7971	760.1103	613.3922	402.9801	238.6284	229.1811	438.8776	617.4735	671.1194	667.6919 (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	1302.2448	1276.7230	1149.1671	937.8252	669.8095	409.9876	239.3763	229.8584	456.1722	753.3504	1049.6471	1288.3753 (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	441.4818	344.9139	262.9073	127.9547	41.9744	0.0000	0.0000	0.0000	0.0000	101.0924	272.5399	461.7885 (98)
RHI space heating demand												2054.6529 (98)
												2055 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.3500 (1b)	x 2.3900 (2b)	= 101.2165 (1b) - (3b)
First floor	42.3500 (1c)	x 2.6100 (2c)	= 110.5335 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.3700
Infiltration rate					0.1685 (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) =	0.1432 (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	0.1826	0.1790	0.1755	0.1575	0.1540	0.1361	0.1361	0.1325	0.1432	0.1540	0.1611	0.1683 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.3500	0.1200	5.0820	84.0000	3557.4000 (28a)					
Brick and Block	100.4000	17.6800	82.7200	0.2400	19.8528	42.2200	3492.4384 (29a)					
Pitched Roof	42.3500		42.3500	0.1000	4.2350	9.1000	385.3850 (30)					
Total net area of external elements Aum(A, m2)			185.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.3172			(33)					
Party Wall 1			30.1000	0.0000	0.0000	110.0000	3311.0000 (32)					
Ground Floor Block			28.7200			75.0000	2154.0000 (32c)					
Ground Floor Stud			47.0300			9.0000	423.2700 (32c)					
First Floor Stud			103.6500			9.0000	932.8500 (32c)					
Internal Floor 1			42.3500			18.0000	762.3000 (32d)					
Internal Ceiling 1			42.3500			18.0000	762.3000 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	15780.9434		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.3157 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0189 (36)					
Total fabric heat loss				(33) + (36) =	60.3361		(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	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388	34.9388 (38)
Average = Sum(39)m / 12 =	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249	1.1249 (40)
HLP (average)												1.1249 (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												2.5460 (42)
Average daily hot water use (litres/day)												94.6679 (43)
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 09 Jan 2014

Daily hot water use	104.1347	100.3480	96.5613	92.7746	88.9878	85.2011	85.2011	88.9878	92.7746	96.5613	100.3480	104.1347 (44)
Energy conte	154.4288	135.0644	139.3744	121.5099	116.5917	100.6098	93.2297	106.9825	108.2602	126.1668	137.7209	149.5560 (45)
Energy content (annual)										Total = Sum (45)m =		1489.4950 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1643	20.2597	20.9062	18.2265	17.4888	15.0915	13.9845	16.0474	16.2390	18.9250	20.6581	22.4334 (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	0.6706	0.6070	0.6056	0.5073	0.4669	0.3857	0.3574	0.4284	0.4520	0.5482	0.6189	0.6495 (61)
Total heat required for water heating calculated for each month	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (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	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (64)
Heat gains from water heating, kWh/month	51.5152	45.0607	46.4934	40.5289	38.8835	33.5492	31.0882	35.6788	36.1095	42.0875	45.9469	49.8897 (65)
										Total per year (kWh/year) = Sum (64)m =		1495.7926 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9753	46.1640	37.5431	28.4225	21.2462	17.9369	19.3815	25.1928	33.8137	42.9342	50.1106	53.4198 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.7653	345.3118	336.3748	317.3491	293.3326	270.7604	255.6808	252.1344	261.0713	280.0970	304.1136	326.6857 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221 (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)	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407 (71)
Water heating gains (Table 5)	69.2409	67.0545	62.4911	56.2901	52.2627	46.5961	41.7853	47.9553	50.1521	56.5692	63.8152	67.0561 (72)
Total internal gains	569.7240	565.2728	543.1515	508.8042	473.5839	442.0359	423.5900	432.0249	451.7796	486.3430	524.7818	553.9042 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North				5.8000	10.6334	0.6300	0.7000			0.7700			18.8483 (74)
East				1.9100	19.6403	0.6300	0.7000			0.7700			11.4644 (76)
South				7.8200	46.7521	0.6300	0.7000			0.7700			111.7325 (78)
Solar gains	142.0452	241.4359	331.2362	415.6282	472.9820	473.5536	454.8421	410.9685	360.0418	266.8593	169.9876	121.6878	(83)
Total gains	711.7691	806.7087	874.3876	924.4324	946.5659	915.5895	878.4321	842.9934	811.8213	753.2023	694.7695	675.5919	(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	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100
alpha	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673
util living area	0.9787	0.9639	0.9366	0.8801	0.7753	0.6172	0.4646	0.5018	0.7103	0.8953	0.9642	0.9825 (86)
MIT	19.7509	19.9438	20.2145	20.5263	20.7875	20.9376	20.9845	20.9787	20.8873	20.5580	20.0861	19.6917 (87)
Th 2	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806 (88)
util rest of house	0.9737	0.9557	0.9221	0.8521	0.7237	0.5353	0.3627	0.3985	0.6343	0.8647	0.9546	0.9784 (89)
MIT 2	18.8622	19.0508	19.3130	19.6063	19.8355	19.9492	19.9757	19.9734	19.9173	19.6421	19.1930	18.8041 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	19.0655	19.2551	19.5192	19.8168	20.0533	20.1753	20.2066	20.2034	20.1392	19.8517	19.3974	19.0072 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0655	19.2551	19.5192	19.8168	20.0533	20.1753	20.2066	20.2034	20.1392	19.8517	19.3974	19.0072 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9681	0.9485	0.9143	0.8469	0.7277	0.5518	0.3859	0.4218	0.6471	0.8602	0.9477	0.9733 (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	1406.7854	1367.6844	1240.4061	1040.0979	795.8604	531.1877	343.6151	362.3671	575.3863	881.4508	1171.6297	1410.7520 (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	534.0034	404.8712	328.0977	185.1662	79.6390	0.0000	0.0000	0.0000	0.0000	173.7334	369.4959	560.3908 (98)
Space heating												2635.3976 (98)
Space heating per m2										(98) / (4) =		31.1145 (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													2921.7269 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	534.0034	404.8712	328.0977	185.1662	79.6390	0.0000	0.0000	0.0000	0.0000	173.7334	369.4959	560.3908	(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)	592.0215	448.8594	363.7447	205.2841	88.2916	0.0000	0.0000	0.0000	0.0000	192.6091	409.6407	621.2758	(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	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055	(64)
Efficiency of water heater	86.6762	86.2880	85.5773	84.1616	81.4450	76.4000	76.4000	76.4000	76.4000	83.8149	85.9698	76.4000	(216)
Fuel for water heating, kWh/month	178.9412	157.2308	163.5713	144.9797	143.7271	132.1931	122.4963	140.5902	142.2934	151.1843	160.9167	172.8830	(219)
Water heating fuel used												1811.0071	(219)
Annual totals kWh/year													
Space heating fuel - main system												2921.7269	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													61.4837 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													136.4837 (231)
Electricity for lighting (calculated in Appendix L)													367.1600 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.82 * 1068 * 1.00) =										-700.6542			-700.6542 (233)
Total delivered energy for all uses													4535.7234 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2921.7269	3.4800	101.6761 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1811.0071	3.4800	63.0230 (247)
Mechanical ventilation fans	61.4837	13.1900	8.1097 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	367.1600	13.1900	48.4284 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-700.6542	13.1900	-92.4163 (252)
Total energy cost			258.7134 (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] =	0.8378 (257)
SAP value		88.3130
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	2921.7269	0.2160	631.0930 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1811.0071	0.2160	391.1775 (264)
Space and water heating			1022.2705 (265)
Pumps and fans	136.4837	0.5190	70.8351 (267)
Energy for lighting	367.1600	0.5190	190.5560 (268)
Energy saving/generation technologies			
PV Unit	-700.6542	0.5190	-363.6395 (269)
Total kg/year			920.0220 (272)
CO2 emissions per m2			10.8600 (273)
EI value			90.4948
EI rating			90 (274)

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EI band

B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8220 = 4.234$, stars = 4
Water heating environmental impact	$0.216 / 0.8220 = 0.2628$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.3500 (1b)	x 2.3900 (2b)	= 101.2165 (1b) - (3b)
First floor	42.3500 (1c)	x 2.6100 (2c)	= 110.5335 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7500 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												3.3700
Infiltration rate												0.1685 (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) =	0.1432 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate												
	0.1683	0.1575	0.1575	0.1432	0.1468	0.1396	0.1396	0.1361	0.1361	0.1468	0.1432	0.1468 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.3500	0.1200	5.0820	84.0000	3557.4000 (28a)					
Brick and Block	100.4000	17.6800	82.7200	0.2400	19.8528	42.2200	3492.4384 (29a)					
Pitched Roof	42.3500		42.3500	0.1000	4.2350	9.1000	385.3850 (30)					
Total net area of external elements Aum(A, m2)			185.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.3172			(33)					
Party Wall 1			30.1000	0.0000	0.0000	110.0000	3311.0000 (32)					
Ground Floor Block			28.7200			75.0000	2154.0000 (32c)					
Ground Floor Stud			47.0300			9.0000	423.2700 (32c)					
First Floor Stud			103.6500			9.0000	932.8500 (32c)					
Internal Floor 1			42.3500			18.0000	762.3000 (32d)					
Internal Ceiling 1			42.3500			18.0000	762.3000 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	15780.9434		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.3157 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0189 (36)					
Total fabric heat loss				(33) + (36) =			60.3361 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9388	Feb 34.9388	Mar 34.9388	Apr 34.9388	May 34.9388	Jun 34.9388	Jul 34.9388	Aug 34.9388	Sep 34.9388	Oct 34.9388	Nov 34.9388	Dec 34.9388 (38)
Heat transfer coeff	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749 (39)
Average = Sum(39)m / 12 =												95.2749 (39)
HLP	Jan 1.1249	Feb 1.1249	Mar 1.1249	Apr 1.1249	May 1.1249	Jun 1.1249	Jul 1.1249	Aug 1.1249	Sep 1.1249	Oct 1.1249	Nov 1.1249	Dec 1.1249 (40)
HLP (average)												1.1249 (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												2.5460 (42)
Average daily hot water use (litres/day)												94.6679 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	104.1347	100.3480	96.5613	92.7746	88.9878	85.2011	85.2011	88.9878	92.7746	96.5613	100.3480	104.1347 (44)
Energy conte	154.4288	135.0644	139.3744	121.5099	116.5917	100.6098	93.2297	106.9825	108.2602	126.1668	137.7209	149.5560 (45)
Energy content (annual)												1489.4950 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1643	20.2597	20.9062	18.2265	17.4888	15.0915	13.9845	16.0474	16.2390	18.9250	20.6581	22.4334 (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	0.6706	0.6070	0.6056	0.5073	0.4669	0.3857	0.3574	0.4284	0.4520	0.5482	0.6189	0.6495 (61)
Total heat required for water heating calculated for each month	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (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	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (64)
Heat gains from water heating, kWh/month	51.5152	45.0607	46.4934	40.5289	38.8835	33.5492	31.0882	35.6788	36.1095	42.0875	45.9469	49.8897 (65)
Total per year (kWh/year) = Sum(64)m = 1495.7926 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9753	46.1640	37.5431	28.4225	21.2462	17.9369	19.3815	25.1928	33.8137	42.9342	50.1106	53.4198 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.7653	345.3118	336.3748	317.3491	293.3326	270.7604	255.6808	252.1344	261.0713	280.0970	304.1136	326.6857 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221 (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)	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407 (71)
Water heating gains (Table 5)	69.2409	67.0545	62.4911	56.2901	52.2627	46.5961	41.7853	47.9553	50.1521	56.5692	63.8152	67.0561 (72)
Total internal gains	569.7240	565.2728	543.1515	508.8042	473.5839	442.0359	423.5900	432.0249	451.7796	486.3430	524.7818	553.9042 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				5.8000	13.4684	0.6300	0.7000		0.7700		23.8735 (74)	
East				1.9100	25.1733	0.6300	0.7000		0.7700		14.6942 (76)	
South				7.8200	56.5862	0.6300	0.7000		0.7700		135.2350 (78)	
Solar gains	173.8027	251.5840	352.6872	447.7284	482.8499	536.5366	494.4986	463.5373	402.4065	300.3373	207.3195	140.9583 (83)
Total gains	743.5267	816.8568	895.8387	956.5326	956.4338	978.5725	918.0886	895.5623	854.1860	786.6803	732.1014	694.8624 (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	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100
alpha	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673
util living area	0.9679	0.9532	0.9153	0.8342	0.6970	0.4816	0.3396	0.3376	0.5865	0.8315	0.9404	0.9737 (86)
MIT	19.9561	20.0917	20.3623	20.6641	20.8798	20.9796	20.9963	20.9965	20.9546	20.7294	20.3117	19.9092 (87)
Th 2	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806 (88)
util rest of house	0.9601	0.9422	0.8955	0.7962	0.6310	0.3916	0.2362	0.2315	0.4941	0.7835	0.9238	0.9671 (89)
MIT 2	19.0642	19.1953	19.4537	19.7295	19.9079	19.9729	19.9799	19.9800	19.9605	19.7928	19.4109	19.0190 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	19.2683	19.4004	19.6616	19.9434	20.1303	20.2032	20.2125	20.2126	20.1880	20.0071	19.6170	19.2227 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2683	19.4004	19.6616	19.9434	20.1303	20.2032	20.2125	20.2126	20.1880	20.0071	19.6170	19.2227 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9534	0.9346	0.8883	0.7947	0.6413	0.4118	0.2599	0.2559	0.5138	0.7849	0.9167	0.9609 (94)
Useful gains	708.8553	763.4584	795.7971	760.1103	613.3922	402.9801	238.6284	229.1811	438.8776	617.4735	671.1194	667.6919 (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	1302.2448	1276.7230	1149.1671	937.8252	669.8095	409.9876	239.3763	229.8584	456.1722	753.3504	1049.6471	1288.3753 (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	441.4818	344.9139	262.9073	127.9547	41.9744	0.0000	0.0000	0.0000	0.0000	101.0924	272.5399	461.7885 (98)
Space heating												2054.6529 (98)
Space heating per m2										(98) / (4) =		24.2580 (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													2277.8857 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	441.4818	344.9139	262.9073	127.9547	41.9744	0.0000	0.0000	0.0000	0.0000	101.0924	272.5399	461.7885	(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)	489.4477	382.3879	291.4715	141.8567	46.5349	0.0000	0.0000	0.0000	0.0000	112.0758	302.1507	511.9606	(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	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055	(64)
Efficiency of water heater (217)m	86.1542	85.8237	84.8735	82.8915	79.6149	76.4000	76.4000	76.4000	76.4000	81.9648	85.0289	76.4000	(216)
Fuel for water heating, kWh/month	180.0253	158.0816	164.9277	147.2011	147.0310	132.1931	122.4963	140.5902	142.2934	154.5969	162.6975	173.9074	(219)
Water heating fuel used												1826.0414	(219)
Annual totals kWh/year													
Space heating fuel - main system												2277.8857	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												61.4837	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												136.4837	(231)
Electricity for lighting (calculated in Appendix L)												367.1600	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.82 * 1184 * 1.00) =											-776.6495	-776.6495	(233)
Total delivered energy for all uses												3830.9213	(238)

10a. Fuel costs - using BEDF prices (559)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2277.8857	5.7300	130.5229 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1826.0414	5.7300	104.6322 (247)
Mechanical ventilation fans	61.4837	24.1800	14.8668 (249)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	367.1600	24.1800	88.7793 (250)
Additional standing charges			114.0000 (251)
Energy saving/generation technologies			
PV Unit	-776.6495	24.1800	-187.7939 (252)
Total energy cost			283.1422 (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	2277.8857	0.2160	492.0233 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1826.0414	0.2160	394.4249 (264)
Space and water heating			886.4483 (265)
Pumps and fans	136.4837	0.5190	70.8351 (267)
Energy for lighting	367.1600	0.5190	190.5560 (268)
Energy saving/generation technologies			
PV Unit	-776.6495	0.5190	-403.0811 (269)
Total kg/year			744.7582 (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	2277.8857	1.2200	2779.0206 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1826.0414	1.2200	2227.7705 (264)
Space and water heating			5006.7911 (265)
Pumps and fans	136.4837	3.0700	419.0051 (267)
Energy for lighting	367.1600	3.0700	1127.1810 (268)

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Energy saving/generation technologies			
PV Unit	-776.6495	3.0700	-2384.3140 (269)
Primary energy kWh/year			4168.6632 (272)
Primary energy kWh/m2/year			49.2168 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 88
Current environmental impact rating:	B 90

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 49	-204 kg (27.4%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£49	2.41 kg/m²	B 90	A 93
Total Savings	£49	2.41 kg/m²		

Potential energy efficiency rating:	B 90
Potential environmental impact rating:	A 93

Fuel prices for cost data on this page from database revision number 559 TEST (13 Dec 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	£122	£134	-£12
Mains gas	£349	£288	£61
Space heating	£278	£278	£0
Water heating	£105	£56	£49
Lighting	£89	£89	£0
Generated (PV)	-£188	-£188	£0
Total cost of fuels	£283	£234	£49
Total cost of uses	£284	£235	£49
Delivered energy	45 kWh/m²	33 kWh/m²	12 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.5 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	6 kg/m²	2 kg/m²
Primary energy	49 kWh/m²	36 kWh/m²	14 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.3500 (1b)	x 2.3900 (2b)	= 101.2165 (1b) - (3b)
First floor	42.3500 (1c)	x 2.6100 (2c)	= 110.5335 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7500 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												3.3700
Infiltration rate												0.1685 (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) =	0.1432 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.1826	0.1790	0.1755	0.1575	0.1540	0.1361	0.1361	0.1325	0.1432	0.1540	0.1611	0.1683 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.3500	0.1200	5.0820	84.0000	3557.4000 (28a)					
Brick and Block	100.4000	17.6800	82.7200	0.2400	19.8528	42.2200	3492.4384 (29a)					
Pitched Roof	42.3500		42.3500	0.1000	4.2350	9.1000	385.3850 (30)					
Total net area of external elements Aum(A, m2)			185.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.3172			(33)					
Party Wall 1			30.1000	0.0000	0.0000	110.0000	3311.0000 (32)					
Ground Floor Block			28.7200			75.0000	2154.0000 (32c)					
Ground Floor Stud			47.0300			9.0000	423.2700 (32c)					
First Floor Stud			103.6500			9.0000	932.8500 (32c)					
Internal Floor 1			42.3500			18.0000	762.3000 (32d)					
Internal Ceiling 1			42.3500			18.0000	762.3000 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		15780.9434 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.3157 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0189 (36)					
Total fabric heat loss						(33) + (36) =	60.3361 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9388	Feb 34.9388	Mar 34.9388	Apr 34.9388	May 34.9388	Jun 34.9388	Jul 34.9388	Aug 34.9388	Sep 34.9388	Oct 34.9388	Nov 34.9388	Dec 34.9388 (38)
Heat transfer coeff	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749 (39)
Average = Sum(39)m / 12 =												95.2749 (39)
HLP	Jan 1.1249	Feb 1.1249	Mar 1.1249	Apr 1.1249	May 1.1249	Jun 1.1249	Jul 1.1249	Aug 1.1249	Sep 1.1249	Oct 1.1249	Nov 1.1249	Dec 1.1249 (40)
HLP (average)												1.1249 (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												2.5460 (42)
Average daily hot water use (litres/day)												94.6679 (43)
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

Daily hot water use	104.1347	100.3480	96.5613	92.7746	88.9878	85.2011	85.2011	88.9878	92.7746	96.5613	100.3480	104.1347 (44)
Energy conte	154.4288	135.0644	139.3744	121.5099	116.5917	100.6098	93.2297	106.9825	108.2602	126.1668	137.7209	149.5560 (45)
Energy content (annual)												1489.4950 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1643	20.2597	20.9062	18.2265	17.4888	15.0915	13.9845	16.0474	16.2390	18.9250	20.6581	22.4334 (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	0.6706	0.6070	0.6056	0.5073	0.4669	0.3857	0.3574	0.4284	0.4520	0.5482	0.6189	0.6495 (61)
Total heat required for water heating calculated for each month	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (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												1.2176 (H8)
Utilisation factor												0.5601 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.6679 (H14)
Volume ratio Veff/V												0.7922 (H15)
Solar storage volume factor												0.9534 (H16)
Solar input												-851.6382 (H17)
Solar input	-24.6958	-41.2102	-70.1857	-94.0627	-116.2065	-114.2495	-112.7397	-98.5012	-77.1462	-52.6818	-29.2928	-20.6662 (63)
Solar input (sum of months) = Sum (63)m =												-851.6382 (63)
Output from w/h	130.4036	94.4612	69.7943	27.9546	0.8521	0.0000	0.0000	8.9097	31.5660	74.0333	109.0471	129.5393 (64)
Total per year (kWh/year) = Sum (64)m =												676.5609 (64)
Heat gains from water heating, kWh/month	51.5152	45.0607	46.4934	40.5289	38.8835	33.5492	31.0882	35.6788	36.1095	42.0875	45.9469	49.8897 (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	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9753	46.1640	37.5431	28.4225	21.2462	17.9369	19.3815	25.1928	33.8137	42.9342	50.1106	53.4198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.7653	345.3118	336.3748	317.3491	293.3326	270.7604	255.6808	252.1344	261.0713	280.0970	304.1136	326.6857	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	(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)	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	(71)
Water heating gains (Table 5)	69.2409	67.0545	62.4911	56.2901	52.2627	46.5961	41.7853	47.9553	50.1521	56.5692	63.8152	67.0561	(72)
Total internal gains	569.7240	565.2728	543.1515	508.8042	473.5839	442.0359	423.5900	432.0249	451.7796	486.3430	524.7818	553.9042	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				5.8000	10.6334	0.6300	0.7000	0.7700	18.8483 (74)			
East				1.9100	19.6403	0.6300	0.7000	0.7700	11.4644 (76)			
South				7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)			
Solar gains	142.0452	241.4359	331.2362	415.6282	472.9820	473.5536	454.8421	410.9685	360.0418	266.8593	169.9876	121.6878 (83)
Total gains	711.7691	806.7087	874.3876	924.4324	946.5659	915.5895	878.4321	842.9934	811.8213	753.2023	694.7695	675.5919 (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	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100
alpha	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673
util living area	0.9787	0.9639	0.9366	0.8801	0.7753	0.6172	0.4646	0.5018	0.7103	0.8953	0.9642	0.9825 (86)
MIT	19.7509	19.9438	20.2145	20.5263	20.7875	20.9376	20.9845	20.9787	20.8873	20.5580	20.0861	19.6917 (87)
Th 2	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806 (88)
util rest of house	0.9737	0.9557	0.9221	0.8521	0.7237	0.5353	0.3627	0.3985	0.6343	0.8647	0.9546	0.9784 (89)
MIT 2	18.8622	19.0508	19.3130	19.6063	19.8355	19.9492	19.9757	19.9734	19.9173	19.6421	19.1930	18.8041 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	19.0655	19.2551	19.5192	19.8168	20.0533	20.1753	20.2066	20.2034	20.1392	19.8517	19.3974	19.0072 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0655	19.2551	19.5192	19.8168	20.0533	20.1753	20.2066	20.2034	20.1392	19.8517	19.3974	19.0072 (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	0.9681	0.9485	0.9143	0.8469	0.7277	0.5518	0.3859	0.4218	0.6471	0.8602	0.9477	0.9733	(94)
Useful gains	689.0389	765.1975	799.4145	782.9226	688.8187	505.1845	338.9771	355.6093	525.3186	647.9382	658.4409	657.5386	(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	1406.7854	1367.6844	1240.4061	1040.0979	795.8604	531.1877	343.6151	362.3671	575.3863	881.4508	1171.6297	1410.7520	(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	534.0034	404.8712	328.0977	185.1662	79.6390	0.0000	0.0000	0.0000	0.0000	173.7334	369.4959	560.3908	(98)
Space heating												2635.3976	(98)
Space heating per m2											(98) / (4) =	31.1145	(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													2921.7269 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	534.0034	404.8712	328.0977	185.1662	79.6390	0.0000	0.0000	0.0000	0.0000	173.7334	369.4959	560.3908	(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)	592.0215	448.8594	363.7447	205.2841	88.2916	0.0000	0.0000	0.0000	0.0000	192.6091	409.6407	621.2758	(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	130.4036	94.4612	69.7943	27.9546	0.8521	0.0000	0.0000	8.9097	31.5660	74.0333	109.0471	129.5393	(64)
Efficiency of water heater (217)m	87.1117	87.2197	87.4299	88.1124	90.0279	76.4000	76.4000	76.4000	76.4000	85.5810	86.6341	76.4000	(216)
Fuel for water heating, kWh/month	149.6970	108.3026	79.8289	31.7260	0.9464	0.0000	0.0000	11.6619	41.3167	86.5066	125.8708	148.4840	(219)
Water heating fuel used												784.3409	(219)
Annual totals kWh/year													
Space heating fuel - main system												2921.7269	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													61.4837 (230a)
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													186.4837 (231)
Electricity for lighting (calculated in Appendix L)													367.1600 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.82 * 1068 * 1.00) =										-700.6542		-700.6542	(233)
Total delivered energy for all uses												3559.0572	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2921.7269	3.4800	101.6761 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	784.3409	3.4800	27.2951 (247)
Mechanical ventilation fans	61.4837	13.1900	8.1097 (249)
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	367.1600	13.1900	48.4284 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-700.6542	13.1900	-92.4163 (252)
Total energy cost			229.5805 (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] =	0.7434 (257)
SAP value		89.6291
SAP rating (Section 12)		90 (258)
SAP band		B

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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	2921.7269	0.2160	631.0930 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	784.3409	0.2160	169.4176 (264)
Space and water heating			800.5106 (265)
Pumps and fans	186.4837	0.5190	96.7851 (267)
Energy for lighting	367.1600	0.5190	190.5560 (268)
Energy saving/generation technologies			
PV Unit	-700.6542	0.5190	-363.6395 (269)
Total kg/year			724.2122 (272)
CO2 emissions per m2			8.5500 (273)
EI value			92.5178
EI rating			93 (274)
EI band			A

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Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.3500 (1b)	x 2.3900 (2b)	= 101.2165 (1b) - (3b)
First floor	42.3500 (1c)	x 2.6100 (2c)	= 110.5335 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7500 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour	
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =												0.0000 / (5) =	0.0000 (8)
Pressure test											Yes		
Measured/design AP50												3.3700	
Infiltration rate												0.1685 (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) =			0.1432 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)	
Adj infilt rate	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)	
	0.1683	0.1575	0.1575	0.1432	0.1468	0.1396	0.1396	0.1361	0.1361	0.1468	0.1432	0.1468 (22b)	
Mechanical extract ventilation - centralised													
If mechanical ventilation:												0.5000 (23a)	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.3500	0.1200	5.0820	84.0000	3557.4000 (28a)					
Brick and Block	100.4000	17.6800	82.7200	0.2400	19.8528	42.2200	3492.4384 (29a)					
Pitched Roof	42.3500		42.3500	0.1000	4.2350	9.1000	385.3850 (30)					
Total net area of external elements Aum(A, m2)			185.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.3172			(33)					
Party Wall 1			30.1000	0.0000	0.0000	110.0000	3311.0000 (32)					
Ground Floor Block			28.7200			75.0000	2154.0000 (32c)					
Ground Floor Stud			47.0300			9.0000	423.2700 (32c)					
First Floor Stud			103.6500			9.0000	932.8500 (32c)					
Internal Floor 1			42.3500			18.0000	762.3000 (32d)					
Internal Ceiling 1			42.3500			18.0000	762.3000 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	15780.9434		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.3157 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0189 (36)					
Total fabric heat loss				(33) + (36) =			60.3361 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.9388	Feb 34.9388	Mar 34.9388	Apr 34.9388	May 34.9388	Jun 34.9388	Jul 34.9388	Aug 34.9388	Sep 34.9388	Oct 34.9388	Nov 34.9388	Dec 34.9388 (38)
Heat transfer coeff	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749	95.2749 (39)
Average = Sum(39)m / 12 =												95.2749 (39)
HLP	Jan 1.1249	Feb 1.1249	Mar 1.1249	Apr 1.1249	May 1.1249	Jun 1.1249	Jul 1.1249	Aug 1.1249	Sep 1.1249	Oct 1.1249	Nov 1.1249	Dec 1.1249 (40)
HLP (average)												1.1249 (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												2.5460 (42)
Average daily hot water use (litres/day)												94.6679 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	104.1347	100.3480	96.5613	92.7746	88.9878	85.2011	85.2011	88.9878	92.7746	96.5613	100.3480	104.1347 (44)
Energy conte	154.4288	135.0644	139.3744	121.5099	116.5917	100.6098	93.2297	106.9825	108.2602	126.1668	137.7209	149.5560 (45)
Energy content (annual)												1489.4950 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.1643	20.2597	20.9062	18.2265	17.4888	15.0915	13.9845	16.0474	16.2390	18.9250	20.6581	22.4334 (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	0.6706	0.6070	0.6056	0.5073	0.4669	0.3857	0.3574	0.4284	0.4520	0.5482	0.6189	0.6495 (61)
Total heat required for water heating calculated for each month												
	155.0994	135.6714	139.9800	122.0172	117.0586	100.9955	93.5872	107.4109	108.7122	126.7150	138.3399	150.2055 (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												1.3603 (H8)
Utilisation factor												0.5206 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.6679 (H14)
Volume ratio Veff/V												0.7922 (H15)
Solar storage volume factor												0.9534 (H16)
Solar input												-884.2145 (H17)
Solar input	-28.8531	-41.0323	-71.2016	-95.7781	-111.3006	-121.0628	-114.7860	-104.6737	-81.9279	-56.6256	-34.1266	-22.8463 (63)
Solar input (sum of months) = Sum (63)m =												-884.2145 (63)
Output from w/h												
	126.2463	94.6391	68.7784	26.2391	5.7579	0.0000	0.0000	2.7372	26.7843	70.0894	104.2133	127.3592 (64)
Total per year (kWh/year) = Sum (64)m =												652.8443 (64)
Heat gains from water heating, kWh/month												
	51.5152	45.0607	46.4934	40.5289	38.8835	33.5492	31.0882	35.6788	36.1095	42.0875	45.9469	49.8897 (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	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611	152.7611 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	51.9753	46.1640	37.5431	28.4225	21.2462	17.9369	19.3815	25.1928	33.8137	42.9342	50.1106	53.4198 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	341.7653	345.3118	336.3748	317.3491	293.3326	270.7604	255.6808	252.1344	261.0713	280.0970	304.1136	326.6857 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221	52.8221 (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)												
	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407	-101.8407 (71)
Water heating gains (Table 5)												
	69.2409	67.0545	62.4911	56.2901	52.2627	46.5961	41.7853	47.9553	50.1521	56.5692	63.8152	67.0561 (72)
Total internal gains												
	569.7240	565.2728	543.1515	508.8042	473.5839	442.0359	423.5900	432.0249	451.7796	486.3430	524.7818	553.9042 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				5.8000	13.4684	0.6300	0.7000	0.7700	23.8735 (74)			
East				1.9100	25.1733	0.6300	0.7000	0.7700	14.6942 (76)			
South				7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)			
Solar gains	173.8027	251.5840	352.6872	447.7284	482.8499	536.5366	494.4986	463.5373	402.4065	300.3373	207.3195	140.9583 (83)
Total gains	743.5267	816.8568	895.8387	956.5326	956.4338	978.5725	918.0886	895.5623	854.1860	786.6803	732.1014	694.8624 (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	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100	46.0100
alpha	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673	4.0673
util living area												
	0.9679	0.9532	0.9153	0.8342	0.6970	0.4816	0.3396	0.3376	0.5865	0.8315	0.9404	0.9737 (86)
MIT	19.9561	20.0917	20.3623	20.6641	20.8798	20.9796	20.9963	20.9965	20.9546	20.7294	20.3117	19.9092 (87)
Th 2	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806	19.9806 (88)
util rest of house												
	0.9601	0.9422	0.8955	0.7962	0.6310	0.3916	0.2362	0.2315	0.4941	0.7835	0.9238	0.9671 (89)
MIT 2	19.0642	19.1953	19.4537	19.7295	19.9079	19.9729	19.9799	19.9800	19.9605	19.7928	19.4109	19.0190 (90)
Living area fraction												
	19.2683	19.4004	19.6616	19.9434	20.1303	20.2032	20.2125	20.2126	20.1880	20.0071	19.6170	19.2227 (92)
MIT												0.0000
Temperature adjustment												
adjusted MIT	19.2683	19.4004	19.6616	19.9434	20.1303	20.2032	20.2125	20.2126	20.1880	20.0071	19.6170	19.2227 (93)

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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	0.9534	0.9346	0.8883	0.7947	0.6413	0.4118	0.2599	0.2559	0.5138	0.7849	0.9167	0.9609	(94)
Useful gains	708.8553	763.4584	795.7971	760.1103	613.3922	402.9801	238.6284	229.1811	438.8776	617.4735	671.1194	667.6919	(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	1302.2448	1276.7230	1149.1671	937.8252	669.8095	409.9876	239.3763	229.8584	456.1722	753.3504	1049.6471	1288.3753	(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	441.4818	344.9139	262.9073	127.9547	41.9744	0.0000	0.0000	0.0000	0.0000	101.0924	272.5399	461.7885	(98)
Space heating												2054.6529	(98)
Space heating per m2												(98) / (4) =	24.2580 (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													2277.8857 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	441.4818	344.9139	262.9073	127.9547	41.9744	0.0000	0.0000	0.0000	0.0000	101.0924	272.5399	461.7885	(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)	489.4477	382.3879	291.4715	141.8567	46.5349	0.0000	0.0000	0.0000	0.0000	112.0758	302.1507	511.9606	(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	126.2463	94.6391	68.7784	26.2391	5.7579	0.0000	0.0000	2.7372	26.7843	70.0894	104.2133	127.3592	(64)
Efficiency of water heater (217)m	86.7169	86.8234	86.9435	87.5102	88.2765	76.4000	76.4000	76.4000	76.4000	83.9884	85.9078	76.4000	(216)
Fuel for water heating, kWh/month	145.5845	109.0019	79.1070	29.9841	6.5226	0.0000	0.0000	3.5827	35.0580	83.4513	121.3083	146.7098	(219)
Water heating fuel used												760.3101	(219)
Annual totals kWh/year													
Space heating fuel - main system												2277.8857	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													61.4837 (230a)
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													186.4837 (231)
Electricity for lighting (calculated in Appendix L)													367.1600 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.82 * 1184 * 1.00) =									-776.6495			-776.6495	(233)
Total delivered energy for all uses												2815.1900	(238)

10a. Fuel costs - using BEDF prices (559)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2277.8857	5.7300	130.5229 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	760.3101	5.7300	43.5658 (247)
Mechanical ventilation fans	61.4837	24.1800	14.8668 (249)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Pump for solar water heating	50.0000	24.1800	12.0900 (249)
Energy for lighting	367.1600	24.1800	88.7793 (250)
Additional standing charges			114.0000 (251)
Energy saving/generation technologies			
PV Unit	-776.6495	24.1800	-187.7939 (252)
Total energy cost			234.1658 (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	2277.8857	0.2160	492.0233 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	760.3101	0.2160	164.2270 (264)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space and water heating			656.2503 (265)
Pumps and fans	186.4837	0.5190	96.7851 (267)
Energy for lighting	367.1600	0.5190	190.5560 (268)
Energy saving/generation technologies			
PV Unit	-776.6495	0.5190	-403.0811 (269)
Total kg/year			540.5103 (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	2277.8857	1.2200	2779.0206 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	760.3101	1.2200	927.5783 (264)
Space and water heating			3706.5989 (265)
Pumps and fans	186.4837	3.0700	572.5051 (267)
Energy for lighting	367.1600	3.0700	1127.1810 (268)
Energy saving/generation technologies			
PV Unit	-776.6495	3.0700	-2384.3140 (269)
Primary energy kWh/year			3021.9710 (272)
Primary energy kWh/m2/year			35.6785 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 21	Issued on Date	08/01/2025
Assessment Reference	As Built	Prop Type Ref	Type F
Project	16 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.67	TER	17.90
Environmental	90 B	% DER<TER	29.20		
CO ₂ Emissions (t/year)	0.74	DFEE	43.86	TFEE	50.95
General Requirements Compliance	Pass	% DFEE<TFEE	13.91		

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 21	Issued on Date	08/01/2025
Assessment Reference	As Built	Prop Type Ref	Type F
Project	16 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.67	TER	17.90
Environmental	90 B	% DER<TER	29.20		
CO ₂ Emissions (t/year)	0.74	DFEE	43.86	TFEE	50.95
General Requirements Compliance	Pass	% DFEE<TFEE	13.91		

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 21	Issued on Date	08/01/2025
Assessment Reference	As Built	Prop Type Ref	Type F
Project	16 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.67	TER	17.90
Environmental	90 B	% DER<TER	29.20		
CO ₂ Emissions (t/year)	0.74	DFEE	43.86	TFEE	50.95
General Requirements Compliance	Pass	% DFEE<TFEE	13.91		

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 21			Issued on Date	08/01/2025
Assessment Reference	As Built	Prop Type Ref	Type F		
Property	16 Shaw Crescent, West End, SOUTHAMPTON, SO30 3LH				
SAP Rating	88 B	DER	12.67	TER	17.90
Environmental	90 B	% DER<TER	29.20		
CO ₂ Emissions (t/year)	0.74	DFEE	43.86	TFEE	50.95
General Requirements Compliance	Pass	% DFEE<TFEE	13.91		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-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:	20.08 m	42.35 m ²	2.39 m
	1st Storey:	20.08 m	42.35 m ²	2.61 m

7.0 Living Area	19.38	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	186.32	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	100.40	82.72

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	30.10

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Block	Dense block, plasterboard on dabs		75.00	28.72
Ground Floor Stud	Plasterboard on timber frame		9.00	47.03
First Floor Stud	Plasterboard on timber frame		9.00	103.65

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.35	42.35

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.35

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	42.35

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.35

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	North							2.15	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					5.80	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					1.91	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					7.82	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	2.84	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	8.74	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E3 Sill	10.56	0.021	No	Knauf P5
Independently assessed	E4 Jamb	29.10	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	20.08	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	20.08	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	14.16	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	6.02	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	10.00	0.039	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	10.00	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	6.02	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	6.02	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	6.02	0.035	No	Knauf P29 Halved

Y-value 0.060 W/m²K

18.0 Pressure Testing

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	3
Manufacturer SFP	0.17
Duct Type	Rigid
Wet Rooms	3

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	21	
Total number of L.E.L. fittings	21	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17960	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.2	
Controls	76.4	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
	Balanced	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	None
25.0 Main Heating 2	None

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901
29.0 Hot Water Cylinder	None

32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.82	South	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£49	B 90	