



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 21, Shaw Crescent
West End , Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 09/07/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 10	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Property	21, Shaw Crescent, West End , Southampton, SO30 3LH		
SAP Rating	89 B	DER	10.81
Environmental	92 A	TER	16.26
CO ₂ Emissions (t/year)	0.61	% DER<TER	33.53
General Requirements Compliance	Pass	DfEE	33.20
		TfEE	41.08
		% DfEE<TfEE	19.18
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TfEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	16.26	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.81	kgCO ₂ /m ²	Pass
	-5.45 (-33.5%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	41.08	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	33.20	kWh/m ² /yr	
	-7.9 (-19.2%)	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	1.18 (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	3.00 (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 830 VUW 306/6-3 (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

0.16

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North

3.28 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

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.00 (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
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	3.0	m ³ /m ² h
Photovoltaic array	0.73	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Assessment Reference	As Built	Prop Type Ref	Type C Terrace		
Property	21, Shaw Crescent, West End , Southampton, SO30 3LH				
SAP Rating	89 B	DER	10.81	TER	16.26
Environmental	92 A	% DER<TER	33.53		
CO ₂ Emissions (t/year)	0.61	DFEE	33.20	TFEE	41.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.18		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	3.75	0.27	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.74	0.24	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	6.47	0.14	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	22.80	0.36	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	9.69	3.10	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	9.69	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.69	0.58	
External wall	E18 Party wall between dwellings	Independently assessed	0.036	20.00	0.72	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	17.66	2.83	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	17.66	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	17.66	0.62	Knauf P29 Halved

Total: **8.96** W/mK:
Y-Value: **0.051** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	0.61	DFEE	33.20	TFEE	41.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.18		
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

Mid-Terrace 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) 16.26 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.81 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)41.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (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: 3.00 (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 830 VUW 306/6-3 (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: 0.16
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Not significant OK
Based on:
Overshading: Average
Windows facing North: 3.28 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
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 3.0 m³/m²h
Photovoltaic array 0.73 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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												3.0000
Infiltration rate												0.1500 (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) =	0.1275 (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												
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (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)			11.1000	1.1450	12.7099		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	48.4500	13.2500	35.2000	0.2400	8.4480	42.2200	1486.1440 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			133.0300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8267		(33)					
Party Wall 1			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Party Wall 2			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19680.2930 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							232.6826 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9587 (36)					
Total fabric heat loss					(33) + (36) =		41.7854 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.8893	Feb 34.8893	Mar 34.8893	Apr 34.8893	May 34.8893	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 34.8893	Oct 34.8893	Nov 34.8893	Dec 34.8893 (38)
Heat transfer coeff	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747 (39)
Average = Sum(39)m / 12 =												76.6747 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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	2.5440 (42)
Average daily hot water use (litres/day)	94.6210 (43)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831	(44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819	(45)
Energy content (annual)	Total = Sum (45)m = 1488.7572												(45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223	(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	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552	(61)
Total heat required for water heating calculated for each month	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(64)
Heat gains from water heating, kWh/month	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165	(65)
Total per year (kWh/year) = Sum (64)m = 1504.8319												(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	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1906	19.7095	16.0289	12.1349	9.0710	7.6581	8.2748	10.7559	14.4366	18.3306	21.3945	22.8074	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.7461	231.1198	225.1382	212.4041	196.3297	181.2220	171.1291	168.7554	174.7370	187.4710	203.5455	218.6532	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609	(72)
Total internal gains	384.6530	382.3626	368.1040	345.2355	322.0418	299.8218	285.5157	291.8272	303.7053	326.7897	353.2186	372.9822	(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					3.2800	10.6334	0.6300	0.7000			0.7700			10.6590 (74)
South					7.8200	46.7521	0.6300	0.7000			0.7700			111.7325 (78)
Solar gains	122.3915	203.3589	267.7090	319.0467	349.4255	344.3757	332.9936	310.0759	285.1124	221.6185	145.5904	105.4330 (83)		
Total gains	507.0445	585.7215	635.8130	664.2822	671.4673	644.1974	618.5093	601.9032	588.8177	548.4082	498.8089	478.4152 (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	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980		
alpha	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532		
util living area	0.9971	0.9927	0.9824	0.9536	0.8763	0.7167	0.5377	0.5745	0.8028	0.9606	0.9932	0.9979	(86)	
MIT	20.0449	20.1952	20.3996	20.6372	20.8463	20.9642	20.9941	20.9915	20.9305	20.6665	20.2970	20.0008	(87)	
Th 2	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	(88)	
util rest of house	0.9962	0.9906	0.9770	0.9385	0.8369	0.6398	0.4393	0.4756	0.7359	0.9448	0.9908	0.9973	(89)	
MIT 2	19.2855	19.4348	19.6365	19.8661	20.0549	20.1443	20.1602	20.1592	20.1231	19.8969	19.5367	19.2415	(90)	
Living area fraction	19.4536	19.6031	19.8054	20.0368	20.2301	20.3258	20.3448	20.3434	20.3018	20.0673	19.7050	19.4096	(91)	
MIT	19.4536	19.6031	19.8054	20.0368	20.2301	20.3258	20.3448	20.3434	20.3018	20.0673	19.7050	19.4096	(92)	
Temperature adjustment	19.4536	19.6031	19.8054	20.0368	20.2301	20.3258	20.3448	20.3434	20.3018	20.0673	19.7050	19.4096	(93)	
adjusted MIT	19.4536	19.6031	19.8054	20.0368	20.2301	20.3258	20.3448	20.3434	20.3018	20.0673	19.7050	19.4096	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9888	0.9741	0.9359	0.8405	0.6557	0.4612	0.4975	0.7481	0.9426	0.9891	0.9965	(94)
Useful gains	504.6135	579.1365	619.3622	621.6811	564.3622	422.3729	285.2600	299.4681	440.4923	516.9539	493.3760	476.7354	(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	1161.8957	1127.3529	1020.1841	853.9069	654.0398	439.0215	287.1314	302.3616	475.5241	725.8989	966.4827	1166.1885	(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	489.0179	368.4014	298.2115	167.2026	66.7201	0.0000	0.0000	0.0000	0.0000	155.4551	340.6369	512.9531	(98)
Space heating													
Space heating per m2	(98) / (4) = 28.3589												(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	2659.2002 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	489.0179	368.4014	298.2115	167.2026	66.7201	0.0000	0.0000	0.0000	0.0000	155.4551	340.6369	512.9531 (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)	542.1485	408.4272	330.6114	185.3687	73.9691	0.0000	0.0000	0.0000	0.0000	172.3449	377.6462	568.6842 (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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (64)
Efficiency of water heater (217)m	86.3614	85.9307	85.1795	83.6907	80.7327	76.2000	76.2000	76.2000	76.2000	83.3034	85.6349	76.2000 (216)
Fuel for water heating, kWh/month	180.7074	158.9054	165.3583	146.6649	145.8218	133.2608	123.4857	141.7627	143.5176	153.0597	162.5904	174.5640 (219)
Water heating fuel used	1829.6988 (219)											
Annual totals kWh/year	1829.6988 (219)											
Space heating fuel - main system	2659.2002 (211)											
Space heating fuel - secondary	0.0000 (215)											
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)												
mechanical ventilation fans (SFP = 0.2240)												57.7851 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												132.7851 (231)
Electricity for lighting (calculated in Appendix L)												391.8936 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =												-630.4424 (233)
Total delivered energy for all uses												4383.1353 (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	2659.2002	0.2160	574.3872 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1829.6988	0.2160	395.2149 (264)
Space and water heating			969.6022 (265)
Pumps and fans	132.7851	0.5190	68.9154 (267)
Energy for lighting	391.8936	0.5190	203.3928 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total CO2, kg/year			914.7108 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.8100 (273)

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

DER		10.8100 ZC1
Total Floor Area	TFA	84.5800
Assumed number of occupants	N	2.5440
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.0263 ZC2
CO2 emissions from cooking, equation (L16)		2.1288 ZC3
Total CO2 emissions		28.9651 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		28.9651 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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour
										heating	heating			
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)		
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)		
Number of intermittent fans											3 * 10 =	30.0000 (7a)		
Number of passive vents											0 * 10 =	0.0000 (7b)		
Number of flueless gas fires											0 * 40 =	0.0000 (7c)		
												Air changes per hour		
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										30.0000	/ (5) =	0.1419 (8)	
Pressure test												Yes		
Measured/design AP50												5.0000		
Infiltration rate												0.3919 (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) =	0.3331 (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	0.4247	0.4164	0.4080	0.3664	0.3581	0.3164	0.3164	0.3081	0.3331	0.3581	0.3747	0.3914 (22b)		
Effective ac	0.5902	0.5867	0.5832	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (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)			11.1000	1.3258	14.7159		(27)					
Ground Floor			42.2900	0.1300	5.4977		(28a)					
Brick and Block	48.4500	13.2500	35.2000	0.1800	6.3360		(29a)					
Pitched Roof	42.2900		42.2900	0.1300	5.4977		(30)					
Total net area of external elements Aum(A, m2)			133.0300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	34.1973		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7813 (36)					
Total fabric heat loss						(33) + (36) =	42.9786 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.1821	Feb 40.9378	Mar 40.6983	Apr 39.5732	May 39.3627	Jun 38.3829	Jul 38.3829	Aug 38.2014	Sep 38.7603	Oct 39.3627	Nov 39.7886	Dec 40.2337 (38)
Heat transfer coeff	84.1608	83.9164	83.6769	82.5518	82.3414	81.3615	81.3615	81.1800	81.7389	82.3414	82.7672	83.2123 (39)
Average = Sum(39)m / 12 =												82.5508 (39)
HLP	Jan 0.9950	Feb 0.9922	Mar 0.9893	Apr 0.9760	May 0.9735	Jun 0.9619	Jul 0.9619	Aug 0.9598	Sep 0.9664	Oct 0.9735	Nov 0.9786	Dec 0.9838 (40)
HLP (average)												0.9760 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)											Total = Sum(45)m =	1488.7572 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223 (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	49.1822	45.7292	45.3248	41.9962	43.3961	45.3248	45.7292	49.1822	49.3151	50.9589 (61)
Solar input	205.3112	181.0249	188.4875	167.1789	161.8587	142.5561	136.5796	152.2542	153.9357	175.2865	186.9678	200.4408 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	205.3112	181.0249	188.4875	167.1789	161.8587	142.5561	136.5796	152.2542	153.9357	175.2865	186.9678	200.4408 (64)
	64.0619	56.3935	58.6146	51.8143	50.0787	43.9352	41.8325	46.8852	47.4110	54.2252	58.0983	62.4425 (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	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1906	19.7095	16.0289	12.1349	9.0710	7.6581	8.2748	10.7559	14.4366	18.3306	21.3945	22.8074	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.7461	231.1198	225.1382	212.4041	196.3297	181.2220	171.1291	168.7554	174.7370	187.4710	203.5455	218.6532	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	86.1046	83.9189	78.7830	71.9644	67.3101	61.0211	56.2265	63.0178	65.8486	72.8834	80.6921	83.9280	(72)
Total internal gains	401.2020	398.9089	384.1107	360.6640	336.8714	314.0618	299.7911	306.6898	319.1828	342.8457	369.7927	389.5493	(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					3.2800	10.6334	0.6300	0.7000	0.7700			10.6590
South					7.8200	46.7521	0.6300	0.7000	0.7700			111.7325 (78)
Solar gains	122.3915	203.3589	267.7090	319.0467	349.4255	344.3757	332.9936	310.0759	285.1124	221.6185	145.5904	105.4330 (83)
Total gains	523.5935	602.2678	651.8197	679.7107	686.2969	658.4375	632.7847	616.7658	604.2953	564.4642	515.3831	494.9823 (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	69.7904	69.9936	70.1940	71.1506	71.3325	72.1915	72.1915	72.3529	71.8582	71.3325	70.9655	70.5858
alpha	5.6527	5.6662	5.6796	5.7434	5.7555	5.8128	5.8128	5.8235	5.7905	5.7555	5.7310	5.7057
util living area	0.9976	0.9943	0.9862	0.9622	0.8944	0.7378	0.5566	0.5922	0.8218	0.9671	0.9944	0.9983 (86)
MIT	19.9909	20.1400	20.3474	20.6045	20.8257	20.9599	20.9933	20.9906	20.9226	20.6438	20.2688	19.9651 (87)
Th 2	20.0875	20.0899	20.0922	20.1034	20.1054	20.1152	20.1152	20.1170	20.1114	20.1054	20.1012	20.0968 (88)
util rest of house	0.9969	0.9924	0.9815	0.9483	0.8555	0.6563	0.4495	0.4853	0.7523	0.9523	0.9923	0.9977 (89)
MIT 2	18.7374	18.9563	19.2586	19.6326	19.9291	20.0872	20.1125	20.1129	20.0496	19.6935	19.1533	18.7066 (90)
Living area fraction	19.0148	19.2183	19.4996	19.8477	20.1275	20.2804	20.3075	20.3072	20.2428	19.9038	19.4002	18.9851 (92)
MIT	19.0148	19.2183	19.4996	19.8477	20.1275	20.2804	20.3075	20.3072	20.2428	19.9038	19.4002	18.9851 (93)
Temperature adjustment												0.0000
adjusted MIT	19.0148	19.2183	19.4996	19.8477	20.1275	20.2804	20.3075	20.3072	20.2428	19.9038	19.4002	18.9851 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9955	0.9899	0.9774	0.9434	0.8566	0.6725	0.4733	0.5090	0.7637	0.9480	0.9899	0.9967 (94)
Useful gains	521.2581	596.2079	637.0872	641.2724	587.9126	442.8240	299.5052	313.9432	461.5276	535.1228	510.1857	493.3385 (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	1238.4087	1201.5392	1087.7631	903.7558	693.9336	462.1622	301.6468	317.1827	502.1080	766.0886	1018.0522	1230.3052 (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	533.5601	406.7826	335.3028	188.9881	78.8796	0.0000	0.0000	0.0000	0.0000	171.8385	365.6639	548.3032 (98)
Space heating												2629.3189 (98)
Space heating per m2												31.0868 (99)
										(98) / (4) =		

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													2815.1166 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	533.5601	406.7826	335.3028	188.9881	78.8796	0.0000	0.0000	0.0000	0.0000	171.8385	365.6639	548.3032	(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)	571.2635	435.5274	358.9966	202.3427	84.4535	0.0000	0.0000	0.0000	0.0000	183.9813	391.5031	587.0484	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	205.3112	181.0249	188.4875	167.1789	161.8587	142.5561	136.5796	152.2542	153.9357	175.2865	186.9678	200.4408	(64)
Efficiency of water heater (217)m	87.3472	87.0289	86.4855	85.3605	83.3513	80.3000	80.3000	80.3000	80.3000	85.0012	86.7102	87.4553	(217)
Fuel for water heating, kWh/month	235.0518	208.0055	217.9411	195.8505	194.1886	177.5294	170.0867	189.6068	191.7008	206.2164	215.6238	229.1924	(219)
Water heating fuel used												2430.9937	(219)
Annual totals kWh/year													
Space heating fuel - main system												2815.1166	(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)												391.8936	(232)
Total delivered energy for all uses												5713.0039	(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	2815.1166	0.2160	608.0652 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2430.9937	0.2160	525.0946 (264)
Space and water heating			1133.1598 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	391.8936	0.5190	203.3928 (268)
Total CO2, kg/m2/year			1375.4776 (272)
Emissions per m2 for space and water heating			13.3975 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4047 (272b)
Emissions per m2 for pumps and fans			0.4602 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3975 * 1.00) + 2.4047 + 0.4602, rounded to 2 d.p.			16.2600 (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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 211.4500 (5)
Dwelling volume			

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) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2919 (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) =	0.2481 (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	0.3163	0.3101	0.3039	0.2729	0.2667	0.2357	0.2357	0.2295	0.2481	0.2667	0.2791	0.2915 (22b)
Effective ac	0.5500	0.5481	0.5462	0.5372	0.5356	0.5278	0.5278	0.5263	0.5308	0.5356	0.5390	0.5425 (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)			11.1000	1.1450	12.7099		(27)
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)
Brick and Block	48.4500	13.2500	35.2000	0.2400	8.4480	42.2200	1486.1440 (29a)
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)
Total net area of external elements Aum(A, m ²)			133.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.8267		(33)
Party Wall 1			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)
Party Wall 2			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)
First Floor Stud			98.5900			9.0000	887.3100 (32c)
Internal Floor 1			42.2900			18.0000	761.2200 (32d)
Internal Ceiling 1			42.2900			9.0000	380.6100 (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) = 19299.6830 (34)
228.1826 (35)
8.9587 (36)
(33) + (36) = 41.7854 (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	38.3803	38.2447	38.1118	37.4877	37.3709	36.8274	36.8274	36.7267	37.0367	37.3709	37.6072	37.8541 (38)
Heat transfer coeff	80.1657	80.0301	79.8973	79.2731	79.1564	78.6128	78.6128	78.5121	78.8222	79.1564	79.3926	79.6396 (39)
Average = Sum(39)m / 12 =												79.2726 (39)
HLP	0.9478	0.9462	0.9446	0.9373	0.9359	0.9294	0.9294	0.9283	0.9319	0.9359	0.9387	0.9416 (40)
HLP (average)												0.9372 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)

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Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)	Total = Sum (45)m = 1488.7572 (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	32.7999	28.6870	29.6024	25.8081	24.7635	21.3690	19.8015	22.7225	22.9939	26.7972	29.2512	31.7649 (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	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1906	19.7095	16.0289	12.1349	9.0710	7.6581	8.2748	10.7559	14.4366	18.3306	21.3945	22.8074	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.7461	231.1198	225.1382	212.4041	196.3297	181.2220	171.1291	168.7554	174.7370	187.4710	203.5455	218.6532	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	44.0858	42.6889	39.7881	35.8445	33.2842	29.6791	26.6149	30.5410	31.9360	36.0177	40.6267	42.6948	(72)
Total internal gains	356.1832	354.6789	342.1159	321.5442	299.8455	279.7199	267.1795	271.2130	282.2702	302.9800	326.7273	345.3160	(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				3.2800	10.6334	0.6300	0.7000			0.7700			10.6590
South				7.8200	46.7521	0.6300	0.7000			0.7700			111.7325 (78)
Solar gains	122.3915	203.3589	267.7090	319.0467	349.4255	344.3757	332.9936	310.0759	285.1124	221.6185	145.5904	105.4330 (83)	
Total gains	478.5747	558.0378	609.8249	640.5909	649.2710	624.0955	600.1731	581.2890	567.3826	524.5985	472.3177	450.7490 (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	66.8743	66.9876	67.0990	67.6272	67.7270	68.1953	68.1953	68.2827	68.0142	67.7270	67.5255	67.3161	
alpha	5.4583	5.4658	5.4733	5.5085	5.5151	5.5464	5.5464	5.5522	5.5343	5.5151	5.5017	5.4877	
util living area	0.9977	0.9941	0.9856	0.9613	0.8943	0.7436	0.5645	0.6038	0.8285	0.9681	0.9946	0.9983	(86)
MIT	19.9304	20.0886	20.3073	20.5726	20.8065	20.9513	20.9912	20.9873	20.9081	20.6074	20.2115	19.8959	(87)
Th 2	20.1271	20.1284	20.1297	20.1359	20.1371	20.1425	20.1425	20.1435	20.1404	20.1371	20.1348	20.1323	(88)
util rest of house	0.9970	0.9924	0.9811	0.9483	0.8582	0.6664	0.4605	0.4999	0.7642	0.9548	0.9927	0.9978	(89)
MIT 2	19.1440	19.3024	19.5200	19.7834	19.9994	20.1178	20.1399	20.1394	20.0874	19.8209	19.4306	19.1139	(90)
Living area fraction	19.3180	19.4764	19.6943	19.9581	20.1780	20.3023	20.3283	20.3271	20.2691	19.9950	19.6034	19.2870	(91)
MIT	19.3180	19.4764	19.6943	19.9581	20.1780	20.3023	20.3283	20.3271	20.2691	19.9950	19.6034	19.2870	(92)
Temperature adjustment	19.3180	19.4764	19.6943	19.9581	20.1780	20.3023	20.3283	20.3271	20.2691	19.9950	19.6034	19.2870	(93)
adjusted MIT	19.3180	19.4764	19.6943	19.9581	20.1780	20.3023	20.3283	20.3271	20.2691	19.9950	19.6034	19.2870	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	476.6947	552.8216	596.5905	605.3765	558.4674	425.5147	290.2508	303.9707	439.6536	499.4580	468.1249	449.4495	(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	1203.9314	1166.5519	1054.1881	876.6106	671.0881	448.2754	293.0924	308.3217	486.2596	743.6715	992.6804	1201.5198	(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	541.0641	412.4268	340.4527	195.2885	83.7898	0.0000	0.0000	0.0000	0.0000	181.6949	377.6800	559.5403	(98)
Space heating													2691.9370 (98)
Space heating per m2													(98) / (4) = 31.8271 (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	738.9602	581.7347	596.6922	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8900	0.9457	0.9344	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	657.6815	550.1214	557.5499	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	825.5111	795.6210	775.4202	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	120.8373	182.6517	162.0955	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												465.5845 (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	30.2093	45.6629	40.5239	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												116.3961 (107)
Space cooling per m2												1.3762 (108)
Energy for space heating												31.8271 (99)
Energy for space cooling												1.3762 (108)
Total												33.2033 (109)
Dwelling Fabric Energy Efficiency (DFEE)												33.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3919 (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) =	0.3331 (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	0.4247	0.4164	0.4080	0.3664	0.3581	0.3164	0.3164	0.3081	0.3331	0.3581	0.3747	0.3914 (22b)
Effective ac	0.5902	0.5867	0.5832	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (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)			11.1000	1.3258	14.7159		(27)
Ground Floor			42.2900	0.1300	5.4977		(28a)
Brick and Block	48.4500	13.2500	35.2000	0.1800	6.3360		(29a)
Pitched Roof	42.2900		42.2900	0.1300	5.4977		(30)
Total net area of external elements Aum(A, m ²)			133.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1973		(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)							8.7813 (36)
Total fabric heat loss						(33) + (36) =	42.9786 (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	41.1821	40.9378	40.6983	39.5732	39.3627	38.3829	38.3829	38.2014	38.7603	39.3627	39.7886	40.2337 (38)
Heat transfer coeff	84.1608	83.9164	83.6769	82.5518	82.3414	81.3615	81.3615	81.1800	81.7389	82.3414	82.7672	83.2123 (39)
Average = Sum(39)m / 12 =												82.5508 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9950	0.9922	0.9893	0.9760	0.9735	0.9619	0.9619	0.9598	0.9664	0.9735	0.9786	0.9838 (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												2.5440 (42)
Average daily hot water use (litres/day)												94.6210 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)										Total = Sum(45)m =		1488.7572 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.7999	28.6870	29.6024	25.8081	24.7635	21.3690	19.8015	22.7225	22.9939	26.7972	29.2512	31.7649 (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	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	127.2022	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1906	19.7095	16.0289	12.1349	9.0710	7.6581	8.2748	10.7559	14.4366	18.3306	21.3945	22.8074	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.7461	231.1198	225.1382	212.4041	196.3297	181.2220	171.1291	168.7554	174.7370	187.4710	203.5455	218.6532	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	35.7202	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	44.0858	42.6889	39.7881	35.8445	33.2842	29.6791	26.6149	30.5410	31.9360	36.0177	40.6267	42.6948	(72)
Total internal gains	356.1832	354.6789	342.1159	321.5442	299.8455	279.7199	267.1795	271.2130	282.2702	302.9800	326.7273	345.3160	(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				3.2800	10.6334	0.6300	0.7000	0.7700	10.6590 (74)			
South				7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)			
Solar gains	122.3915	203.3589	267.7090	319.0467	349.4255	344.3757	332.9936	310.0759	285.1124	221.6185	145.5904	105.4330 (83)
Total gains	478.5747	558.0378	609.8249	640.5909	649.2710	624.0955	600.1731	581.2890	567.3826	524.5985	472.3177	450.7490 (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	69.7904	69.9936	70.1940	71.1506	71.3325	72.1915	72.1915	72.3529	71.8582	71.3325	70.9655	70.5858	
alpha	5.6527	5.6662	5.6796	5.7434	5.7555	5.8128	5.8128	5.8235	5.7905	5.7555	5.7310	5.7057	
util living area	0.9985	0.9961	0.9899	0.9706	0.9124	0.7663	0.5842	0.6241	0.8502	0.9760	0.9964	0.9989	(86)
MIT	19.9401	20.0909	20.3027	20.5675	20.8011	20.9512	20.9915	20.9877	20.9062	20.6050	20.2208	19.9149	(87)
Th 2	20.0875	20.0899	20.0922	20.1034	20.1054	20.1152	20.1152	20.1170	20.1114	20.1054	20.1012	20.0968	(88)
util rest of house	0.9980	0.9948	0.9863	0.9593	0.8778	0.6858	0.4732	0.5135	0.7851	0.9647	0.9950	0.9986	(89)
MIT 2	19.1150	19.2672	19.4793	19.7475	19.9652	20.0913	20.1128	20.1133	20.0587	19.7881	19.4065	19.0976	(90)
Living area fraction	19.2976	19.4495	19.6615	19.9290	20.1502	20.2816	20.3073	20.3068	fLA = Living area / (4) =			0.2213	(91)
MIT	19.2976	19.4495	19.6615	19.9290	20.1502	20.2816	20.3073	20.3068	20.2463	19.9689	19.5867	19.2784	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2976	19.4495	19.6615	19.9290	20.1502	20.2816	20.3073	20.3068	20.2463	19.9689	19.5867	19.2784	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9974	0.9935	0.9841	0.9566	0.8798	0.7022	0.4990	0.5382	0.7963	0.9625	0.9939	0.9981	(94)
Ext temp.	477.3365	554.4314	600.1582	612.7835	571.2168	438.2163	298.8566	312.8549	451.7895	504.9031	469.4184	449.9091	(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	1262.2112	1220.9443	1101.3148	910.4627	695.8049	462.2673	301.6323	317.1545	502.3894	771.4467	1033.4911	1254.7128	(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	583.9468	447.8966	372.8606	214.3290	92.6936	0.0000	0.0000	0.0000	0.0000	198.3085	406.1323	598.7740	(98)
Space heating per m2												2914.9414	(98)
												34.4637	(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	764.7980	602.0750	616.9683	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8837	0.9434	0.9317	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	675.8747	567.9952	574.8015	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	825.5111	795.6210	775.4202	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	107.7382	169.3536	149.2604	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												426.3522	(104)
Cooled fraction												1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	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	26.9346	42.3384	37.3151	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											106.5880 (107)
Space cooling per m2											1.2602 (108)
Energy for space heating											34.4637 (99)
Energy for space cooling											1.2602 (108)
Total											35.7239 (109)
Target Fabric Energy Efficiency (TFEE)											41.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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												3.0000
Infiltration rate												0.1500 (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) =	0.1275 (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	0.1498	0.1403	0.1403	0.1275	0.1307	0.1243	0.1243	0.1211	0.1211	0.1307	0.1275	0.1307 (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)			11.1000	1.1450	12.7099		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	48.4500	13.2500	35.2000	0.2400	8.4480	42.2200	1486.1440 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			133.0300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8267		(33)					
Party Wall 1			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Party Wall 2			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19680.2930 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							232.6826 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9587 (36)					
Total fabric heat loss						(33) + (36) =	41.7854 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.8893	Feb 34.8893	Mar 34.8893	Apr 34.8893	May 34.8893	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 34.8893	Oct 34.8893	Nov 34.8893	Dec 34.8893 (38)
Heat transfer coeff	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747 (39)
Average = Sum(39)m / 12 =												76.6747 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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	2.5440 (42)
Average daily hot water use (litres/day)	94.6210 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831	(44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819	(45)
Energy content (annual)	Total = Sum (45)m = 1488.7572												(45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223	(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	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552	(61)
Total heat required for water heating calculated for each month	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(64)
RHI water heating demand	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165	(65)
Heat gains from water heating, kWh/month	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165	(65)
	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165	(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	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.4766	49.2738	40.0722	30.3372	22.6774	19.1452	20.6871	26.8899	36.0915	45.8265	53.4863	57.0185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4121	344.9549	336.0272	317.0211	293.0294	270.4806	255.4166	251.8738	260.8015	279.8075	303.7992	326.3481	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609	(72)
Total internal gains	573.1335	568.2905	545.5648	510.5833	474.8765	443.0960	424.7440	433.6080	453.9532	489.1506	528.0926	557.4166	(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				3.2800	13.4684	0.6300		0.7000		0.7700	13.5009 (74)	
South				7.8200	56.5862	0.6300		0.7000		0.7700	135.2350 (78)	
Solar gains	148.7359	210.0548	281.8867	339.7325	353.2418	386.8954	358.7598	345.9095	314.9617	246.9960	176.2581	121.3631 (83)
Total gains	721.8694	778.3453	827.4514	850.3159	828.1183	829.9914	783.5037	779.5175	768.9149	736.1465	704.3507	678.7798 (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	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	
alpha	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	
util living area	0.9762	0.9632	0.9271	0.8445	0.6945	0.4678	0.3226	0.3145	0.5496	0.8178	0.9469	0.9814	(86)
MIT	20.4132	20.5064	20.6791	20.8549	20.9623	20.9966	20.9997	20.9997	20.9917	20.9009	20.6501	20.3752	(87)
Th 2	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	(88)
util rest of house	0.9697	0.9534	0.9083	0.8075	0.6330	0.3926	0.2409	0.2323	0.4714	0.7686	0.9306	0.9761	(89)
MIT 2	19.6485	19.7382	19.9012	20.0574	20.1407	20.1608	20.1619	20.1619	20.1587	20.0974	19.8772	19.6119	(90)
Living area fraction	19.8178	19.9082	20.0733	20.2339	20.3225	20.3458	20.3473	20.3473	20.3430	20.2753	20.0483	19.7808	(91)
MIT	19.8178	19.9082	20.0733	20.2339	20.3225	20.3458	20.3473	20.3473	20.3430	20.2753	20.0483	19.7808	(92)
Temperature adjustment	19.8178	19.9082	20.0733	20.2339	20.3225	20.3458	20.3473	20.3473	20.3430	20.2753	20.0483	19.7808	(93)
adjusted MIT	19.8178	19.9082	20.0733	20.2339	20.3225	20.3458	20.3473	20.3473	20.3430	20.2753	20.0483	19.7808	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9664	0.9499	0.9061	0.8110	0.6453	0.4093	0.2590	0.2505	0.4886	0.7758	0.9280	0.9731	(94)
Useful gains	697.6096	739.3394	749.7327	689.5638	534.3842	339.6760	202.9194	195.2659	375.6956	571.0941	653.6674	660.5317	(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	1090.1428	1066.4092	956.3897	777.0126	553.7854	340.8798	202.9829	195.3168	379.0056	626.8351	877.7927	1079.6411	(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	292.0447	219.7909	153.7528	62.9632	14.4344	0.0000	0.0000	0.0000	0.0000	41.4713	161.3702	311.8174	(98)
Space heating												1257.6448	(98)
RHI space heating demand												1258	(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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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												3.0000
Infiltration rate												0.1500 (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) =	0.1275 (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												
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (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)			11.1000	1.1450	12.7099		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	48.4500	13.2500	35.2000	0.2400	8.4480	42.2200	1486.1440 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			133.0300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8267		(33)					
Party Wall 1			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Party Wall 2			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19680.2930 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							232.6826 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9587 (36)					
Total fabric heat loss						(33) + (36) =	41.7854 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.8893	Feb 34.8893	Mar 34.8893	Apr 34.8893	May 34.8893	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 34.8893	Oct 34.8893	Nov 34.8893	Dec 34.8893 (38)
Heat transfer coeff	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747 (39)
Average = Sum(39)m / 12 =												76.6747 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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	2.5440 (42)
Average daily hot water use (litres/day)	94.6210 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831 (44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819 (45)
Energy content (annual)										Total = Sum (45)m =		1488.7572 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223 (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	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552 (61)
Total heat required for water heating calculated for each month	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371 (64)
Heat gains from water heating, kWh/month	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165 (65)
										Total per year (kWh/year) = Sum (64)m =		1504.8319 (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	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.4766	49.2738	40.0722	30.3372	22.6774	19.1452	20.6871	26.8899	36.0915	45.8265	53.4863	57.0185 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4121	344.9549	336.0272	317.0211	293.0294	270.4806	255.4166	251.8738	260.8015	279.8075	303.7992	326.3481 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083 (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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617 (71)
Water heating gains (Table 5)	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609 (72)
Total internal gains	573.1335	568.2905	545.5648	510.5833	474.8765	443.0960	424.7440	433.6080	453.9532	489.1506	528.0926	557.4166 (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					3.2800	10.6334	0.6300	0.7000			0.7700			10.6590 (74)
South					7.8200	46.7521	0.6300	0.7000			0.7700			111.7325 (78)
Solar gains	122.3915	203.3589	267.7090	319.0467	349.4255	344.3757	332.9936	310.0759	285.1124	221.6185	145.5904	105.4330 (83)		
Total gains	695.5250	771.6494	813.2738	829.6300	824.3020	787.4717	757.7376	743.6840	739.0656	710.7691	673.6830	662.8497 (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	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980
alpha	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532
util living area	0.9861	0.9738	0.9494	0.8951	0.7839	0.6070	0.4429	0.4708	0.6826	0.8962	0.9725	0.9893 (86)
MIT	20.2672	20.4046	20.5814	20.7718	20.9175	20.9844	20.9978	20.9969	20.9698	20.8023	20.4939	20.2205 (87)
Th 2	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619 (88)
util rest of house	0.9824	0.9670	0.9364	0.8684	0.7344	0.5342	0.3598	0.3868	0.6120	0.8648	0.9641	0.9863 (89)
MIT 2	19.5051	19.6393	19.8094	19.9856	20.1084	20.1548	20.1613	20.1610	20.1465	20.0159	19.7281	19.4593 (90)
Living area fraction									fLA = Living area / (4) =			0.2213 (91)
MIT	19.6738	19.8087	19.9803	20.1596	20.2874	20.3384	20.3465	20.3460	20.3287	20.1900	19.8976	19.6278 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6738	19.8087	19.9803	20.1596	20.2874	20.3384	20.3465	20.3460	20.3287	20.1900	19.8976	19.6278 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9797	0.9636	0.9331	0.8683	0.7423	0.5499	0.3782	0.4055	0.6266	0.8660	0.9609	0.9840 (94)
Useful gains	681.4198	743.5281	758.8439	720.3970	611.8417	433.0319	286.5860	301.5405	463.1251	615.5141	647.3395	652.2293 (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	1178.7789	1143.1202	1033.5967	863.3294	658.4395	439.9882	287.2596	302.5589	477.5861	735.3071	981.2489	1182.9200 (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	370.0352	268.5259	204.4161	102.9113	34.6687	0.0000	0.0000	0.0000	0.0000	89.1260	240.4147	394.8339 (98)
Space heating												1704.9318 (98)
Space heating per m2										(98) / (4) =		20.1576 (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													1890.1683 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	370.0352	268.5259	204.4161	102.9113	34.6687	0.0000	0.0000	0.0000	0.0000	89.1260	240.4147	394.8339	(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)	410.2386	297.7006	226.6254	114.0923	38.4354	0.0000	0.0000	0.0000	0.0000	98.8093	266.5352	437.7316	(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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(64)
Efficiency of water heater	85.5381	84.9394	83.9108	82.0046	78.9891	76.2000	76.2000	76.2000	76.2000	81.3978	84.5059	76.2000	(216)
Fuel for water heating, kWh/month	182.4466	160.7599	167.8586	149.6804	149.0408	133.2608	123.4857	141.7627	143.5176	156.6430	164.7627	176.0797	(219)
Water heating fuel used												1849.2986	(219)
Annual totals kWh/year													
Space heating fuel - main system												1890.1683	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													57.7851 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													132.7851 (231)
Electricity for lighting (calculated in Appendix L)													391.8936 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424			-630.4424 (233)
Total delivered energy for all uses													3633.7031 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1890.1683	3.4800	65.7779 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1849.2986	3.4800	64.3556 (247)
Mechanical ventilation fans	57.7851	13.1900	7.6218 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	391.8936	13.1900	51.6908 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-630.4424	13.1900	-83.1553 (252)
Total energy cost			236.1832 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.7655 (257)
SAP rating (Section 12)		89.3209
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	1890.1683	0.2160	408.2764 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1849.2986	0.2160	399.4485 (264)
Space and water heating			807.7248 (265)
Pumps and fans	132.7851	0.5190	68.9154 (267)
Energy for lighting	391.8936	0.5190	203.3928 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			752.8335 (272)
CO2 emissions per m2			8.9000 (273)
EI value			92.2149
EI rating			92 (274)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI band A

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	$3.48 / 0.8099 = 4.297$, stars = 4
Water heating environmental impact	$0.216 / 0.8099 = 0.2667$, 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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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											3.0000	
Infiltration rate											0.1500 (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) =	0.1275 (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	0.1498	0.1403	0.1403	0.1275	0.1307	0.1243	0.1243	0.1211	0.1211	0.1307	0.1275	0.1307 (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)			11.1000	1.1450	12.7099		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	48.4500	13.2500	35.2000	0.2400	8.4480	42.2200	1486.1440 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			133.0300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8267		(33)					
Party Wall 1			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Party Wall 2			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19680.2930 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							232.6826 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9587 (36)					
Total fabric heat loss						(33) + (36) =	41.7854 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.8893	Feb 34.8893	Mar 34.8893	Apr 34.8893	May 34.8893	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 34.8893	Oct 34.8893	Nov 34.8893	Dec 34.8893 (38)
Heat transfer coeff	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747 (39)
Average = Sum(39)m / 12 =												76.6747 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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	2.5440 (42)
Average daily hot water use (litres/day)	94.6210 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831	(44)
Energy conte	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819	(45)
Energy content (annual)										Total =	Sum (45)m =	1488.7572	(45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223	(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	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552	(61)
Total heat required for water heating calculated for each month	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(64)
Heat gains from water heating, kWh/month	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165	(65)
										Total per year (kWh/year) =	Sum (64)m =	1504.8319	(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	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.4766	49.2738	40.0722	30.3372	22.6774	19.1452	20.6871	26.8899	36.0915	45.8265	53.4863	57.0185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4121	344.9549	336.0272	317.0211	293.0294	270.4806	255.4166	251.8738	260.8015	279.8075	303.7992	326.3481	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609	(72)
Total internal gains	573.1335	568.2905	545.5648	510.5833	474.8765	443.0960	424.7440	433.6080	453.9532	489.1506	528.0926	557.4166	(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				3.2800	13.4684	0.6300		0.7000		0.7700	13.5009 (74)	
South				7.8200	56.5862	0.6300		0.7000		0.7700	135.2350 (78)	
Solar gains	148.7359	210.0548	281.8867	339.7325	353.2418	386.8954	358.7598	345.9095	314.9617	246.9960	176.2581	121.3631 (83)
Total gains	721.8694	778.3453	827.4514	850.3159	828.1183	829.9914	783.5037	779.5175	768.9149	736.1465	704.3507	678.7798 (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	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	
alpha	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	
util living area	0.9762	0.9632	0.9271	0.8445	0.6945	0.4678	0.3226	0.3145	0.5496	0.8178	0.9469	0.9814 (86)	
MIT	20.4132	20.5064	20.6791	20.8549	20.9623	20.9966	20.9997	20.9997	20.9917	20.9009	20.6501	20.3752 (87)	
Th 2	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619 (88)	
util rest of house	0.9697	0.9534	0.9083	0.8075	0.6330	0.3926	0.2409	0.2323	0.4714	0.7686	0.9306	0.9761 (89)	
MIT 2	19.6485	19.7382	19.9012	20.0574	20.1407	20.1608	20.1619	20.1619	20.1587	20.0974	19.8772	19.6119 (90)	
Living area fraction									fLA = Living area / (4) =			0.2213 (91)	
MIT	19.8178	19.9082	20.0733	20.2339	20.3225	20.3458	20.3473	20.3473	20.3430	20.2753	20.0483	19.7808 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.8178	19.9082	20.0733	20.2339	20.3225	20.3458	20.3473	20.3473	20.3430	20.2753	20.0483	19.7808 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9664	0.9499	0.9061	0.8110	0.6453	0.4093	0.2590	0.2505	0.4886	0.7758	0.9280	0.9731	(94)
Useful gains	697.6096	739.3394	749.7327	689.5638	534.3842	339.6760	202.9194	195.2659	375.6956	571.0941	653.6674	660.5317	(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	1090.1428	1066.4092	956.3897	777.0126	553.7854	340.8798	202.9829	195.3168	379.0056	626.8351	877.7927	1079.6411	(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	292.0447	219.7909	153.7528	62.9632	14.4344	0.0000	0.0000	0.0000	0.0000	41.4713	161.3702	311.8174	(98)
Space heating												1257.6448	(98)
Space heating per m2												(98) / (4) =	14.8693 (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													1394.2847 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	292.0447	219.7909	153.7528	62.9632	14.4344	0.0000	0.0000	0.0000	0.0000	41.4713	161.3702	311.8174	(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)	323.7746	243.6706	170.4576	69.8039	16.0027	0.0000	0.0000	0.0000	0.0000	45.9770	178.9027	345.6956	(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	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(64)
Efficiency of water heater (217)m	84.7755	84.2673	82.9166	80.4326	77.5140	76.2000	76.2000	76.2000	76.2000	79.2176	83.1261	76.2000	(216)
Fuel for water heating, kWh/month	184.0878	162.0422	169.8713	152.6058	151.8769	133.2608	123.4857	141.7627	143.5176	160.9540	167.4977	177.6079	(219)
Water heating fuel used												1868.5705	(219)
Annual totals kWh/year													
Space heating fuel - main system												1394.2847	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													57.7851 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													132.7851 (231)
Electricity for lighting (calculated in Appendix L)													391.8936 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1206 * 1.00) =										-704.3100			-704.3100 (233)
Total delivered energy for all uses													3083.2239 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1394.2847	7.3800	102.8982 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1868.5705	7.3800	137.9005 (247)
Mechanical ventilation fans	57.7851	28.6600	16.5612 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Energy for lighting	391.8936	28.6600	112.3167 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-704.3100	28.6600	-201.8552 (252)
Total energy cost			296.3164 (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	1394.2847	0.2160	301.1655 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1868.5705	0.2160	403.6112 (264)
Space and water heating			704.7767 (265)
Pumps and fans	132.7851	0.5190	68.9154 (267)
Energy for lighting	391.8936	0.5190	203.3928 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	0.5190	-365.5369 (269)
Total kg/year			611.5481 (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	1394.2847	1.2200	1701.0274 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1868.5705	1.2200	2279.6560 (264)
Space and water heating			3980.6833 (265)
Pumps and fans	132.7851	3.0700	407.6501 (267)
Energy for lighting	391.8936	3.0700	1203.1133 (268)

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Energy saving/generation technologies			
PV Unit	-704.3100	3.0700	-2162.2316 (269)
Primary energy kWh/year			3429.2151 (272)
Primary energy kWh/m2/year			40.5440 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 89
Current environmental impact rating:	A 92

(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	-£ 66	-208 kg (34.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£66 2.46 kg/m²	B 91	A 94
Total Savings	£66 2.46 kg/m²		

Potential energy efficiency rating:	B 91
Potential environmental impact rating:	A 94

Fuel prices for cost data on this page from database revision number 550 TEST (28 Jun 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£150	£165	-£14
Mains gas	£348	£268	£80
Space heating	£248	£248	£0
Water heating	£138	£72	£66
Lighting	£112	£112	£0
Generated (PV)	-£202	-£202	£0
Total cost of fuels	£296	£231	£66
Total cost of uses	£296	£230	£66
Delivered energy	36 kWh/m²	24 kWh/m²	12 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.4 tonnes	0.2 tonnes
CO2 emissions per m²	7 kg/m²	5 kg/m²	2 kg/m²
Primary energy	41 kWh/m²	27 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	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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												3.0000
Infiltration rate												0.1500 (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) =	0.1275 (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												
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (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)			11.1000	1.1450	12.7099		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	48.4500	13.2500	35.2000	0.2400	8.4480	42.2200	1486.1440 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			133.0300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8267		(33)					
Party Wall 1			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Party Wall 2			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19680.2930 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							232.6826 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9587 (36)					
Total fabric heat loss					(33) + (36) =		41.7854 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.8893	Feb 34.8893	Mar 34.8893	Apr 34.8893	May 34.8893	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 34.8893	Oct 34.8893	Nov 34.8893	Dec 34.8893 (38)
Heat transfer coeff	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747 (39)
Average = Sum(39)m / 12 =												76.6747 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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	2.5440 (42)
Average daily hot water use (litres/day)	94.6210 (43)

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Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831	(44)
Energy content (annual)	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819	(45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223	(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	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552	(61)
Total heat required for water heating calculated for each month	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(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													1.2182 (H8)
Utilisation factor													0.5600 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													75.0000 (H13)
Daily hot water demand													94.6210 (H14)
Volume ratio Veff/V													0.7926 (H15)
Solar storage volume factor													0.9535 (H16)
Solar input	-24.6905	-41.2013	-70.1706	-94.0424	-116.1814	-114.2249	-112.7153	-98.4800	-77.1296	-52.6704	-29.2865	-20.6617	(63)
Solar input (sum of months) = Sum(63)m =													-851.4546 (63)
Output from w/h	131.3709	95.3472	70.6809	28.7025	1.5444	0.0000	0.0000	9.5432	32.2309	74.8335	109.9478	130.4754	(64)
Total per year (kWh/year) = Sum(64)m =													684.6767 (64)
Heat gains from water heating, kWh/month	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165	(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	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.4766	49.2738	40.0722	30.3372	22.6774	19.1452	20.6871	26.8899	36.0915	45.8265	53.4863	57.0185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4121	344.9549	336.0272	317.0211	293.0294	270.4806	255.4166	251.8738	260.8015	279.8075	303.7992	326.3481	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609	(72)
Total internal gains	573.1335	568.2905	545.5648	510.5833	474.8765	443.0960	424.7440	433.6080	453.9532	489.1506	528.0926	557.4166	(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												3.2800		10.6334		0.6300		0.7000		0.7700		10.6590	(74)
South												7.8200		46.7521		0.6300		0.7000		0.7700		111.7325	(78)
Solar gains	122.3915	203.3589	267.7090	319.0467	349.4255	344.3757	332.9936	310.0759	285.1124	221.6185	145.5904											105.4330	(83)
Total gains	695.5250	771.6494	813.2738	829.6300	824.3020	787.4717	757.7376	743.6840	739.0656	710.7691	673.6830											662.8497	(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	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	
Feb	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	
tau	0.9861	0.9738	0.9494	0.8951	0.7839	0.6070	0.4429	0.4708	0.6826	0.8962	0.9725	0.9893	(86)
MIT	20.2672	20.4046	20.5814	20.7718	20.9175	20.9844	20.9978	20.9969	20.9698	20.8023	20.4939	20.2205	(87)
Th 2	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	(88)
util rest of house	0.9824	0.9670	0.9364	0.8684	0.7344	0.5342	0.3598	0.3868	0.6120	0.8648	0.9641	0.9863	(89)
MIT 2	19.5051	19.6393	19.8094	19.9856	20.1084	20.1548	20.1613	20.1610	20.1465	20.0159	19.7281	19.4593	(90)
Living area fraction													0.2213 (91)
MIT	19.6738	19.8087	19.9803	20.1596	20.2874	20.3384	20.3465	20.3460	20.3287	20.1900	19.8976	19.6278	(92)
Temperature adjustment													0.0000
adjusted MIT	19.6738	19.8087	19.9803	20.1596	20.2874	20.3384	20.3465	20.3460	20.3287	20.1900	19.8976	19.6278	(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	0.9797	0.9636	0.9331	0.8683	0.7423	0.5499	0.3782	0.4055	0.6266	0.8660	0.9609	0.9840	(94)
Useful gains	681.4198	743.5281	758.8439	720.3970	611.8417	433.0319	286.5860	301.5405	463.1251	615.5141	647.3395	652.2293	(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	1178.7789	1143.1202	1033.5967	863.3294	658.4395	439.9882	287.2596	302.5589	477.5861	735.3071	981.2489	1182.9200	(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	370.0352	268.5259	204.4161	102.9113	34.6687	0.0000	0.0000	0.0000	0.0000	89.1260	240.4147	394.8339	(98)
Space heating												1704.9318	(98)
Space heating per m2												20.1576	(99)

(98) / (4) =

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													1890.1683 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	370.0352	268.5259	204.4161	102.9113	34.6687	0.0000	0.0000	0.0000	0.0000	89.1260	240.4147	394.8339	(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)	410.2386	297.7006	226.6254	114.0923	38.4354	0.0000	0.0000	0.0000	0.0000	98.8093	266.5352	437.7316	(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	131.3709	95.3472	70.6809	28.7025	1.5444	0.0000	0.0000	9.5432	32.2309	74.8335	109.9478	130.4754	(64)
Efficiency of water heater (217)m	86.0574	86.0570	86.1340	86.7251	89.4987	76.2000	76.2000	76.2000	76.2000	83.2214	85.2830	76.2000	(216)
Fuel for water heating, kWh/month	152.6549	110.7954	82.0592	33.0959	1.7257	0.0000	0.0000	12.5239	42.2978	89.9210	128.9211	151.2522	(219)
Water heating fuel used												805.2472	(219)
Annual totals kWh/year													
Space heating fuel - main system												1890.1683	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													57.7851 (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													182.7851 (231)
Electricity for lighting (calculated in Appendix L)													391.8936 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424		-630.4424	(233)
Total delivered energy for all uses												2639.6517	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1890.1683	3.4800	65.7779 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	805.2472	3.4800	28.0226 (247)
Mechanical ventilation fans	57.7851	13.1900	7.6218 (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	391.8936	13.1900	51.6908 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-630.4424	13.1900	-83.1553 (252)
Total energy cost			206.4452 (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] =	0.6691 (257)
SAP value		90.6655
SAP rating (Section 12)		91 (258)
SAP band		B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1890.1683	0.2160	408.2764 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	805.2472	0.2160	173.9334 (264)
Space and water heating			582.2097 (265)
Pumps and fans	182.7851	0.5190	94.8654 (267)
Energy for lighting	391.8936	0.5190	203.3928 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			553.2684 (272)
CO2 emissions per m2			6.5400 (273)
EI value			94.2786
EI rating			94 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2900 (1b)	x 2.3900 (2b)	= 101.0731 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.4500 (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											3.0000	
Infiltration rate											0.1500 (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) =	0.1275 (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	0.1498	0.1403	0.1403	0.1275	0.1307	0.1243	0.1243	0.1211	0.1211	0.1307	0.1275	0.1307 (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)			11.1000	1.1450	12.7099		(27)					
Ground Floor			42.2900	0.1200	5.0748	84.0000	3552.3600 (28a)					
Brick and Block	48.4500	13.2500	35.2000	0.2400	8.4480	42.2200	1486.1440 (29a)					
Pitched Roof	42.2900		42.2900	0.1000	4.2290	9.1000	384.8390 (30)					
Total net area of external elements Aum(A, m2)			133.0300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8267		(33)					
Party Wall 1			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Party Wall 2			44.1500	0.0000	0.0000	110.0000	4856.5000 (32)					
Ground Floor Stud			23.1100			75.0000	1733.2500 (32c)					
Ground Floor Stud			44.5500			9.0000	400.9500 (32c)					
First Floor Stud			98.5900			9.0000	887.3100 (32c)					
Internal Floor 1			42.2900			18.0000	761.2200 (32d)					
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19680.2930 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							232.6826 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9587 (36)					
Total fabric heat loss						(33) + (36) =	41.7854 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.8893	Feb 34.8893	Mar 34.8893	Apr 34.8893	May 34.8893	Jun 34.8893	Jul 34.8893	Aug 34.8893	Sep 34.8893	Oct 34.8893	Nov 34.8893	Dec 34.8893 (38)
Heat transfer coeff	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747	76.6747 (39)
Average = Sum(39)m / 12 =												76.6747 (39)
HLP	Jan 0.9065	Feb 0.9065	Mar 0.9065	Apr 0.9065	May 0.9065	Jun 0.9065	Jul 0.9065	Aug 0.9065	Sep 0.9065	Oct 0.9065	Nov 0.9065	Dec 0.9065 (40)
HLP (average)												0.9065 (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	2.5440 (42)
Average daily hot water use (litres/day)	94.6210 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0831	100.2983	96.5134	92.7286	88.9438	85.1589	85.1589	88.9438	92.7286	96.5134	100.2983	104.0831	(44)
Energy content (annual)	154.3523	134.9975	139.3053	121.4497	116.5339	100.5599	93.1835	106.9295	108.2066	126.1043	137.6527	149.4819	(45)
Distribution loss (46)m = 0.15 x (45)m	23.1528	20.2496	20.8958	18.2175	17.4801	15.0840	13.9775	16.0394	16.2310	18.9156	20.6479	22.4223	(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	1.7091	1.5510	1.5462	1.2951	1.1920	0.9848	0.9126	1.0937	1.1539	1.3996	1.5815	1.6552	(61)
Total heat required for water heating calculated for each month	156.0614	136.5485	140.8515	122.7449	117.7259	101.5447	94.0961	108.0232	109.3604	127.5039	139.2342	151.1371	(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													1.3609 (H8)
Utilisation factor													0.5204 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													75.0000 (H13)
Daily hot water demand													94.6210 (H14)
Volume ratio Veff/V													0.7926 (H15)
Solar storage volume factor													0.9535 (H16)
Solar input	-28.8464	-41.0228	-71.1851	-95.7559	-111.2749	-121.0348	-114.7594	-104.6495	-81.9089	-56.6125	-34.1187	-884.0098	(H17)
Solar input (sum of months) = Sum(63)m =													-884.0098 (63)
Output from w/h	127.2150	95.5257	69.6664	26.9889	6.4510	0.0000	0.0000	3.3737	27.4515	70.8914	105.1155	128.2961	(64)
Total per year (kWh/year) = Sum(64)m =													660.9755 (64)
Heat gains from water heating, kWh/month	51.7494	45.2744	46.7056	40.7058	39.0455	33.6824	31.2117	35.8275	36.2672	42.2796	46.1649	50.1165	(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	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	152.6426	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.4766	49.2738	40.0722	30.3372	22.6774	19.1452	20.6871	26.8899	36.0915	45.8265	53.4863	57.0185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4121	344.9549	336.0272	317.0211	293.0294	270.4806	255.4166	251.8738	260.8015	279.8075	303.7992	326.3481	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	52.8083	(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)	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	-101.7617	(71)
Water heating gains (Table 5)	69.5557	67.3726	62.7763	56.5359	52.4805	46.7811	41.9512	48.1552	50.3710	56.8274	64.1179	67.3609	(72)
Total internal gains	573.1335	568.2905	545.5648	510.5833	474.8765	443.0960	424.7440	433.6080	453.9532	489.1506	528.0926	557.4166	(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				3.2800	13.4684	0.6300	0.7000	0.7700	13.5009 (74)			
South				7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)			

Solar gains	148.7359	210.0548	281.8867	339.7325	353.2418	386.8954	358.7598	345.9095	314.9617	246.9960	176.2581	121.3631 (83)
Total gains	721.8694	778.3453	827.4514	850.3159	828.1183	829.9914	783.5037	779.5175	768.9149	736.1465	704.3507	678.7798 (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	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	71.2980	
Feb	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	5.7532	
Mar	0.9762	0.9632	0.9271	0.8445	0.6945	0.4678	0.3226	0.3145	0.5496	0.8178	0.9469	0.9814	(86)
Apr	20.4132	20.5064	20.6791	20.8549	20.9623	20.9966	20.9997	20.9997	20.9917	20.9009	20.6501	20.3752	(87)
May	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	20.1619	(88)
Jun	0.9697	0.9534	0.9083	0.8075	0.6330	0.3926	0.2409	0.2323	0.4714	0.7686	0.9306	0.9761	(89)
Jul	19.6485	19.7382	19.9012	20.0574	20.1407	20.1608	20.1619	20.1619	20.1587	20.0974	19.8772	19.6119	(90)
Aug	19.8178	19.9082	20.0733	20.2339	20.3225	20.3458	20.3473	20.3473	20.3430	20.2753	20.0483	19.7808	(91)
Sep													0.2213 (91)
Oct													0.0000 (92)
Nov													19.7808 (93)
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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9664	0.9499	0.9061	0.8110	0.6453	0.4093	0.2590	0.2505	0.4886	0.7758	0.9280	0.9731	(94)
Useful gains	697.6096	739.3394	749.7327	689.5638	534.3842	339.6760	202.9194	195.2659	375.6956	571.0941	653.6674	660.5317	(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	1090.1428	1066.4092	956.3897	777.0126	553.7854	340.8798	202.9829	195.3168	379.0056	626.8351	877.7927	1079.6411	(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	292.0447	219.7909	153.7528	62.9632	14.4344	0.0000	0.0000	0.0000	0.0000	41.4713	161.3702	311.8174	(98)
Space heating												1257.6448	(98)
Space heating per m2											(98) / (4) =	14.8693	(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													1394.2847	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	292.0447	219.7909	153.7528	62.9632	14.4344	0.0000	0.0000	0.0000	0.0000	41.4713	161.3702	311.8174	(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)	323.7746	243.6706	170.4576	69.8039	16.0027	0.0000	0.0000	0.0000	0.0000	45.9770	178.9027	345.6956	(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	127.2150	95.5257	69.6664	26.9889	6.4510	0.0000	0.0000	3.3737	27.4515	70.8914	105.1155	128.2961	(64)	
Efficiency of water heater (217)m	85.4371	85.4441	85.3125	85.4875	85.3561	76.2000	76.2000	76.2000	76.2000	80.8304	84.1048	76.2000	(216)	
Fuel for water heating, kWh/month	148.8991	111.7990	81.6603	31.5706	7.5578	0.0000	0.0000	4.4275	36.0256	87.7039	124.9816	149.8530	(219)	
Water heating fuel used												784.4784	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1394.2847	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)														
mechanical ventilation fans (SFP = 0.2240)													57.7851	(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													182.7851	(231)
Electricity for lighting (calculated in Appendix L)													391.8936	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1206 * 1.00) =										-704.3100		-704.3100	(233)	
Total delivered energy for all uses												2049.1318	(238)	

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1394.2847	7.3800	102.8982 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	784.4784	7.3800	57.8945 (247)
Mechanical ventilation fans	57.7851	28.6600	16.5612 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Pump for solar water heating	50.0000	28.6600	14.3300 (249)
Energy for lighting	391.8936	28.6600	112.3167 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-704.3100	28.6600	-201.8552 (252)
Total energy cost			230.6404 (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	1394.2847	0.2160	301.1655 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	784.4784	0.2160	169.4473 (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			470.6128 (265)
Pumps and fans	182.7851	0.5190	94.8654 (267)
Energy for lighting	391.8936	0.5190	203.3928 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	0.5190	-365.5369 (269)
Total kg/year			403.3342 (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	1394.2847	1.2200	1701.0274 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	784.4784	1.2200	957.0636 (264)
Space and water heating			2658.0910 (265)
Pumps and fans	182.7851	3.0700	561.1501 (267)
Energy for lighting	391.8936	3.0700	1203.1133 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	3.0700	-2162.2316 (269)
Primary energy kWh/year			2260.1228 (272)
Primary energy kWh/m2/year			26.7217 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 10	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Project	21, Shaw Crescent, West End , Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	10.81	TER	16.26
Environmental	92 A	% DER<TER	33.53		
CO ₂ Emissions (t/year)	0.61	DFEE	33.20	TFEE	41.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.18		

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 10	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Project	21, Shaw Crescent, West End , Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	10.81	TER	16.26
Environmental	92 A	% DER<TER	33.53		
CO ₂ Emissions (t/year)	0.61	DFEE	33.20	TFEE	41.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.18		

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 10	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Project	21, Shaw Crescent, West End , Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	10.81	TER	16.26
Environmental	92 A	% DER<TER	33.53		
CO ₂ Emissions (t/year)	0.61	DFEE	33.20	TFEE	41.08
General Requirements Compliance	Pass	% DFEE<TFEE	19.18		

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 10	Issued on Date	09/07/2024
Assessment Reference	As Built	Prop Type Ref	Type C Terrace
Property	21, Shaw Crescent, West End , Southampton, SO30 3LH		
SAP Rating	89 B	DER	10.81
Environmental	92 A	TER	16.26
CO ₂ Emissions (t/year)	0.61	% DER<TER	33.53
General Requirements Compliance	Pass	DFEE	33.20
		TFEE	41.08
		% DFEE<TFEE	19.18
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, Mid-Terrace
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: 9.69 m	42.29 m ²	2.39 m
	1st Storey: 9.69 m	42.29 m ²	2.61 m

7.0 Living Area	18.72	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	232.68	kJ/m²K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	48.45	35.20

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	44.15
Party Wall 2	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	44.15

9.2 Internal Walls		Kappa (kJ/m ² K)	Area (m ²)
Description	Construction		
Ground Floor Stud	Dense block, plasterboard on dabs	75.00	23.11
Ground Floor Stud	Plasterboard on timber frame	9.00	44.55
First Floor Stud	Plasterboard on timber frame	9.00	98.59

10.0 External Roofs

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.29	42.29

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.29

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	42.29

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.29

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					3.28	
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)	3.75	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.74	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	6.47	0.021	No	Knauf P5
Independently assessed	E4 Jamb	22.80	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	9.69	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	9.69	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.69	0.060	No	
Independently assessed	E18 Party wall between dwellings	20.00	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	17.66	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	17.66	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	17.66	0.035	No	Knauf P29 Halved

Y-value	0.051	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	3.00	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	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

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	17	
Total number of L.E.L. fittings	17	
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	17959	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.2	
Controls	76.2	
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
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.73	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£66	B 91	