



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 16 Haines Crescent
WEST END, SO30 3LG

Contact: Tobias Whiting
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Report Issue Date: 02/08/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 100	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Property	16 Haines Crescent, WEST END, SO30 3LG		
SAP Rating	84 B	DER	11.78
Environmental	92 A	TER	17.64
CO ₂ Emissions (t/year)	0.57	% DER<TER	33.22
General Requirements Compliance	Pass	DfEE	39.42
		TfEE	42.80
		% DfEE<TfEE	7.88
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)	17.64	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.78	kgCO ₂ /m ²	Pass
	-5.86 (-33.2%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	42.80	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	39.42	kWh/m ² /yr	
	-3.4 (-7.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.27 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.13 (max. 0.20)	0.17 (max. 0.35)	Pass
Openings	1.24 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.30 (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
Worcester Greenstar 30Si Compact ErP
Combi boiler
Efficiency: 89.8% 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

0.35

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North West

3.98 m², No overhang

Air change rate

3.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Door U-value

1.10

W/m²K

Photovoltaic array

803.42

kWh/Year

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Environmental	92 A	TER	17.64
CO ₂ Emissions (t/year)	0.57	% DER<TER	33.22
General Requirements Compliance	Pass	DFEE	39.42
		TFEE	42.80
		% DFEE<TFEE	7.88
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
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Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	0.91	0.27	
External wall	E3 Sill	Table K1 - Approved	0.040	0.91	0.04	
External wall	E4 Jamb	Table K1 - Approved	0.050	2.40	0.12	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	31.50	2.21	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	0.240	3.25	0.78	
External wall	E11 Eaves (insulation at rafter level)	Table K1 - Approved	0.040	18.44	0.74	
External wall	E12 Gable (insulation at ceiling level)	Table K1 - Approved	0.240	2.77	0.66	
External wall	E13 Gable (insulation at rafter level)	Table K1 - Approved	0.040	6.36	0.25	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	11.07	1.00	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	1.14	0.07	
External wall	E25 Staggered party wall between dwellings	Table K1 - Default	0.120	2.35	0.28	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	3.49	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Default	0.240	0.74	0.18	
Party wall	P5 Party wall - Roof (insulation at rafter level)	Table K1 - Default	0.080	2.13	0.17	
External roof	R1 Head of roof window	Table K1 - Default	0.080	5.59	0.45	
External roof	R2 Sill of roof window	Table K1 - Default	0.060	5.59	0.34	
External roof	R3 Jamb of roof window	Table K1 - Default	0.080	11.92	0.95	
External roof	R6 Flat ceiling	Table K1 - Default	0.060	18.44	1.11	
External roof	R7 Flat ceiling (inverted)	Table K1 - Default	0.040	19.75	0.79	

Total: **10.40** W/mK:
Y-Value: **0.078** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	92 A	% DER<TER	33.22		
CO ₂ Emissions (t/year)	0.57	DFEE	39.42	TFEE	42.80
General Requirements Compliance	Pass	% DFEE<TFEE	7.88		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Top-floor flat, total floor area 70 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.64 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.78 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)39.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.17 (max. 0.35)	OK
Openings	1.24 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.30 (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
Worcester Greenstar 30Si Compact ErP
Combi boiler
Efficiency: 89.8% 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: 0.35
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading: Average
Windows facing North West: 3.98 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 803.42 kWh/Year

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	69.7800 (1b)	x 2.0700 (2b)	= 144.4446 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 144.4446 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.3000
Infiltration rate					0.2150 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1989 (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	0.2536	0.2486	0.2436	0.2188	0.2138	0.1889	0.1889	0.1840	0.1989	0.2138	0.2237	0.2337 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5036	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			3.9800	1.1450	4.5573		(27)
Roof Window (Uw = 1.40)			2.6900	1.3258	3.5663		(27a)
Walls	36.1100		36.1100	0.2700	9.7497		(29a)
Wall to Corridor	5.2200	2.1200	3.1000	0.2041	0.6327		(29a)
Dormer	12.0000	3.9800	8.0200	0.2100	1.6842		(29a)
Pitched Roof	39.4100		39.4100	0.1000	3.9410		(30)
Sloping Ceilings	41.0700	2.6900	38.3800	0.1700	6.5246		(30)
Total net area of external elements Aum(A, m ²)			133.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			32.9877	(33)
Party Wall 1			7.1100	0.0000	0.0000		(32)
Party Floor 1			57.9100				(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

250.0000 (35)
10.3985 (36)
(33) + (36) = 43.3862 (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	24.0033	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334 (38)
Heat transfer coeff	67.3895	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196 (39)
Average = Sum(39)m / 12 =												67.2337 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9657	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633 (40)
HLP (average)												0.9635 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)

2.2408 (42)
87.4183 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.1602	92.6634	89.1667	85.6700	82.1732	78.6765	78.6765	82.1732	85.6700	89.1667	92.6634	96.1602 (44)
Energy conte	142.6027	124.7213	128.7012	112.2048	107.6632	92.9051	86.0903	98.7898	99.9697	116.5051	127.1744	138.1031 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)	Total = Sum (45)m = 1375.4308 (45)										
Distribution loss (46)m = 0.15 x (45)m											
	21.3904	18.7082	19.3052	16.8307	16.1495	13.9358	12.9135	14.8185	14.9955	17.4758	20.7155 (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 (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 (57)
Combi loss	31.2106	28.1745	31.1681	30.1343	31.1182	30.0906	31.0788	31.1043	30.1144	31.1475	30.1756 (61)
Total heat required for water heating calculated for each month	173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500 (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 (63)
	Solar input (sum of months) = Sum (63)m =										0.0000 (63)
Output from w/h	173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500 (64)
	Total per year (kWh/year) = Sum (64)m =										1742.1501 (64)
Heat gains from water heating, kWh/month	55.2181	48.5134	50.5852	44.8417	43.5776	38.4136	36.3947	40.6237	40.7685	46.5248	49.8294 (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	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1114	17.8628	14.5270	10.9979	8.2210	6.9405	7.4995	9.7481	13.0839	16.6131	19.3899	20.6704	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.7831	198.8250	193.6793	182.7246	168.8962	155.8996	147.2170	145.1750	150.3207	161.2754	175.1038	188.1005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	(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)	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	(71)
Water heating gains (Table 5)	74.2178	72.1926	67.9908	62.2801	58.5720	53.3522	48.9176	54.6018	56.6230	62.5333	69.2075	72.2042	(72)
Total internal gains	350.7239	348.4921	335.8087	315.6142	295.3008	275.8039	263.2457	269.1364	279.6392	300.0334	323.3127	340.5866	(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	

Northwest					3.9800	11.2829	0.6300	0.7000		0.7700		13.7239 (81)	
Southeast					2.6900	39.9751	0.6300	0.7000		1.0000		42.6799 (82)	

Solar gains	56.4038	106.3903	170.0279	246.8761	306.0955	315.9637	299.6632	254.2488	196.7687	124.4626	69.5081	46.9700 (83)	
Total gains	407.1277	454.8824	505.8366	562.4902	601.3964	591.7676	562.9089	523.3853	476.4079	424.4960	392.8209	387.5566 (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	71.9078	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896
alpha	5.7939	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060
util living area	0.9982	0.9962	0.9892	0.9605	0.8691	0.6918	0.5194	0.5791	0.8414	0.9776	0.9962	0.9987 (86)
MIT	19.9987	20.1235	20.3392	20.6196	20.8572	20.9710	20.9953	20.9915	20.9123	20.6042	20.2434	19.9659 (87)
Th 2	20.1120	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140 (88)
util rest of house	0.9977	0.9949	0.9854	0.9463	0.8257	0.6102	0.4180	0.4736	0.7750	0.9668	0.9947	0.9982 (89)
MIT 2	19.1937	19.3197	19.5335	19.8054	20.0178	20.1007	20.1128	20.1115	20.0652	19.7948	19.4396	19.1626 (90)
Living area fraction									fLA =	Living area / (4) =		
MIT	19.4466	19.5722	19.7866	20.0611	20.2815	20.3741	20.3900	20.3879	20.3313	20.0490	19.6921	19.4149 (91)
Temperature adjustment												0.0000
adjusted MIT	19.4466	19.5722	19.7866	20.0611	20.2815	20.3741	20.3900	20.3879	20.3313	20.0490	19.6921	19.4149 (92)
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												0.0000

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9971	0.9939	0.9837	0.9453	0.8347	0.6352	0.4501	0.5070	0.7930	0.9658	0.9938	0.9978 (94)
Useful gains	405.9343	452.1268	497.5800	531.7184	501.9941	375.8992	253.3582	265.3513	377.8067	409.9953	390.3666	386.6951 (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	1020.7203	986.2605	893.1183	750.2473	576.8446	388.1320	254.7623	268.0679	418.8633	635.1607	846.4359	1022.7416 (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	457.4008	358.9379	294.2805	157.3408	55.6888	0.0000	0.0000	0.0000	0.0000	167.5230	328.3699	473.2186 (98)
Space heating												2292.7602 (98)
Space heating per m2												(98) / (4) = 32.8570 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2527.8503 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	457.4008	358.9379	294.2805	157.3408	55.6888	0.0000	0.0000	0.0000	0.0000	167.5230	328.3699	473.2186	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	504.3008	395.7418	324.4548	173.4739	61.3989	0.0000	0.0000	0.0000	0.0000	184.7001	362.0396	521.7405	(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	173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500	169.3056	(64)
Efficiency of water heater (217)m	89.6501	89.5622	89.3622	88.9041	88.0283	87.0000	87.0000	87.0000	87.0000	88.9282	89.4674	87.0000	(216)
Fuel for water heating, kWh/month	193.8797	170.7147	178.9004	160.1041	157.6554	141.3744	134.6771	149.3037	149.5220	166.0356	175.8741	188.7573	(219)
Water heating fuel used												1966.7984	(219)
Annual totals kWh/year													
Space heating fuel - main system												2527.8503	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4900)													
mechanical ventilation fans (SFP = 0.4900)													86.3490 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													161.3490 (231)
Electricity for lighting (calculated in Appendix L)													355.1742 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													5011.1719 (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	2527.8503	0.2160	546.0157	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1966.7984	0.2160	424.8285	(264)
Space and water heating			970.8441	(265)
Pumps and fans	161.3490	0.5190	83.7401	(267)
Energy for lighting	355.1742	0.5190	184.3354	(268)
Energy saving/generation technologies				
PV Unit	-803.4200	0.5190	-416.9750	(269)
Total CO2, kg/year			821.9447	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.7800	(273)

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

DER			11.7800	ZC1
Total Floor Area		TFA	69.7800	
Assumed number of occupants		N	2.2408	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.7110	ZC2
CO2 emissions from cooking, equation (L16)			2.4760	ZC3
Total CO2 emissions			30.9671	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			30.9671	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	69.7800 (1b)	x 2.0700 (2b)	= 144.4446 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 144.4446 (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					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1385 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3885 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3593 (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	0.4581	0.4492	0.4402	0.3953	0.3863	0.3414	0.3414	0.3324	0.3593	0.3863	0.4042	0.4222 (22b)
Effective ac	0.6049	0.6009	0.5969	0.5781	0.5746	0.5583	0.5583	0.5552	0.5646	0.5746	0.5817	0.5891 (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			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			3.9800	1.3258	5.2765		(27)
TER Room Window (Uw = 1.70)			2.6900	1.5918	4.2818		(27a)
Walls	36.1100		36.1100	0.1800	6.4998		(29a)
Wall to Corridor	5.2200	2.1200	3.1000	0.1800	0.5580		(29a)
Dormer	12.0000	3.9800	8.0200	0.1800	1.4436		(29a)
Pitched Roof	39.4100		39.4100	0.1300	5.1233		(30)
Sloping Ceilings	41.0700	2.6900	38.3800	0.1300	4.9894		(30)
Total net area of external elements Aum(A, m ²)			133.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.2925		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.7061 (36)
Total fabric heat loss						(33) + (36) =	39.9986 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.8358	28.6416	28.4512	27.5568	27.3895	26.6106	26.6106	26.4663	26.9106	27.3895	27.7280	28.0819 (38)
Heat transfer coeff	68.8344	68.6401	68.4497	67.5554	67.3881	66.6091	66.6091	66.4649	66.9092	67.3881	67.7266	68.0805 (39)
Average = Sum(39)m / 12 =												67.5546 (39)
HLP	0.9864	0.9837	0.9809	0.9681	0.9657	0.9546	0.9546	0.9525	0.9589	0.9657	0.9706	0.9756 (40)
HLP (average)												0.9681 (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												2.2408 (42)
Average daily hot water use (litres/day)												87.4183 (43)
Daily hot water use	96.1602	92.6634	89.1667	85.6700	82.1732	78.6765	78.6765	82.1732	85.6700	89.1667	92.6634	96.1602 (44)
Energy conte	142.6027	124.7213	128.7012	112.2048	107.6632	92.9051	86.0903	98.7898	99.9697	116.5051	127.1744	138.1031 (45)
Energy content (annual)										Total = Sum(45)m =		1375.4308 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.3904	18.7082	19.3052	16.8307	16.1495	13.9358	12.9135	14.8185	14.9955	17.4758	19.0762	20.7155 (46)
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	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	49.0022	42.6506	45.4384	42.2482	41.8746	38.7994	40.0927	41.8746	42.2482	45.4384	45.6970	49.0022 (61)
Solar input	191.6049	167.3718	174.1396	154.4530	149.5378	131.7045	126.1830	140.6644	142.2179	161.9434	172.8714	187.1053 (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	191.6049	167.3718	174.1396	154.4530	149.5378	131.7045	126.1830	140.6644	142.2179	161.9434	172.8714	187.1053 (64)
	59.6660	52.1325	54.1527	47.8701	46.2667	40.5908	38.6482	43.3163	43.8020	50.0975	53.7097	58.1698 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1114	17.8628	14.5270	10.9979	8.2210	6.9405	7.4995	9.7481	13.0839	16.6131	19.3899	20.6704	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.7831	198.8250	193.6793	182.7246	168.8962	155.8996	147.2170	145.1750	150.3207	161.2754	175.1038	188.1005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	(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)	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	(71)
Water heating gains (Table 5)	80.1962	77.5781	72.7859	66.4863	62.1864	56.3761	51.9465	58.2208	60.8361	67.3354	74.5969	78.1853	(72)
Total internal gains	356.7022	353.8775	340.6038	319.8204	298.9152	278.8278	266.2745	272.7555	283.8523	304.8355	328.7021	346.5677	(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			
Northwest				3.9800	11.2829	0.6300	0.7000	0.7700	13.7239 (81)			
Southeast				2.6900	39.9751	0.6300	0.7000	1.0000	42.6799 (82)			
Solar gains	56.4038	106.3903	170.0279	246.8761	306.0955	315.9637	299.6632	196.7687	69.5081	46.9700 (83)		
Total gains	413.1060	460.2678	510.6317	566.6964	605.0108	594.7915	565.9377	527.0043	480.6210	429.2980	398.2102	393.5377 (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	70.3984	70.5977	70.7941	71.7313	71.9094	72.7503	72.7503	72.9082	72.4241	71.9094	71.5500	71.1780	
alpha	5.6932	5.7065	5.7196	5.7821	5.7940	5.8500	5.8500	5.8605	5.8283	5.7940	5.7700	5.7452	
util living area	0.9981	0.9961	0.9890	0.9598	0.8674	0.6845	0.5125	0.5699	0.8358	0.9765	0.9960	0.9986	(86)
MIT	19.9773	20.1025	20.3230	20.6192	20.8581	20.9733	20.9958	20.9924	20.9164	20.6078	20.2420	19.9564	(87)
Th 2	20.0946	20.0970	20.0993	20.1100	20.1120	20.1214	20.1214	20.1231	20.1178	20.1120	20.1079	20.1037	(88)
util rest of house	0.9975	0.9947	0.9852	0.9453	0.8237	0.6036	0.4130	0.4666	0.7687	0.9654	0.9944	0.9981	(89)
MIT 2	18.7229	18.9072	19.2292	19.6582	19.9722	20.1035	20.1197	20.1199	20.0500	19.6499	19.1195	18.6990	(90)
Living area fraction	19.1170	19.2827	19.5728	19.9601	20.2505	20.3767	20.3949	20.3940	20.3221	19.9508	19.4721	19.0940	(92)
Temperature adjustment	19.1170	19.2827	19.5728	19.9601	20.2505	20.3767	20.3949	20.3940	20.3221	19.9508	19.4721	19.0940	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9965	0.9931	0.9822	0.9423	0.8312	0.6281	0.4444	0.4992	0.7859	0.9628	0.9928	0.9973	(94)
Ext temp.	411.6706	457.0924	501.5623	534.0076	502.8970	373.5837	251.5185	263.0706	377.7312	413.3122	395.3350	392.4885	(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	1019.9158	987.2284	894.8282	747.1668	576.1994	384.7809	252.7768	265.4602	416.3186	630.1310	837.9222	1013.9906	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	452.5344	356.2514	292.5898	153.4746	54.5370	0.0000	0.0000	0.0000	0.0000	161.3132	318.6628	462.3976	(98)
												2251.7607	(98)
												32.2694	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2410.8787 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	452.5344	356.2514	292.5898	153.4746	54.5370	0.0000	0.0000	0.0000	0.0000	161.3132	318.6628	462.3976	(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)	484.5122	381.4255	313.2653	164.3197	58.3908	0.0000	0.0000	0.0000	0.0000	172.7122	341.1807	495.0724	(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	191.6049	167.3718	174.1396	154.4530	149.5378	131.7045	126.1830	140.6644	142.2179	161.9434	172.8714	187.1053	(64)
Efficiency of water heater (217)m	87.1398	86.9060	86.3478	85.0352	82.7714	80.3000	80.3000	80.3000	80.3000	85.0414	86.5705	87.2390	(216)
Fuel for water heating, kWh/month	219.8823	192.5894	201.6722	181.6342	180.6637	164.0156	157.1394	175.1736	177.1082	190.4290	199.6887	214.4743	(219)
Water heating fuel used												2254.4706	(219)
Annual totals kWh/year													
Space heating fuel - main system												2410.8787	(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)												355.1742	(232)
Total delivered energy for all uses												5095.5236	(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	2410.8787	0.2160	520.7498 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2254.4706	0.2160	486.9657 (264)
Space and water heating			1007.7155 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	355.1742	0.5190	184.3354 (268)
Total CO2, kg/m2/year			1230.9759 (272)
Emissions per m2 for space and water heating			14.4413 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6417 (272b)
Emissions per m2 for pumps and fans			0.5578 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4413 * 1.00) + 2.6417 + 0.5578, rounded to 2 d.p.			17.6400 (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	69.7800 (1b)	x 2.0700 (2b)	= 144.4446 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 144.4446 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1385 (8)
Measured/design AP50					Yes
Infiltration rate					4.3000
Number of sides sheltered					0.3535 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3270 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4169	0.4087	0.4005	0.3596	0.3515	0.3106	0.3106	0.3024	0.3270	0.3515	0.3678	0.3842 (22b)
	0.5869	0.5835	0.5802	0.5647	0.5618	0.5482	0.5482	0.5457	0.5534	0.5618	0.5676	0.5738 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			3.9800	1.1450	4.5573		(27)
Roof Window (Uw = 1.40)			2.6900	1.3258	3.5663		(27a)
Walls	36.1100		36.1100	0.2700	9.7497		(29a)
Wall to Corridor	5.2200	2.1200	3.1000	0.2041	0.6327		(29a)
Dormer	12.0000	3.9800	8.0200	0.2100	1.6842		(29a)
Pitched Roof	39.4100		39.4100	0.1000	3.9410		(30)
Sloping Ceilings	41.0700	2.6900	38.3800	0.1700	6.5246		(30)
Total net area of external elements Aum(A, m ²)			133.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.9877		(33)
Party Wall 1			7.1100	0.0000	0.0000		(32)
Party Floor 1			57.9100				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3985 (36)
Total fabric heat loss						(33) + (36) =	43.3862 (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	27.9750	27.8142	27.6565	26.9161	26.7776	26.1327	26.1327	26.0133	26.3811	26.7776	27.0578	27.3508 (38)
Heat transfer coeff	71.3612	71.2004	71.0427	70.3023	70.1638	69.5189	69.5189	69.3994	69.7673	70.1638	70.4440	70.7370 (39)
Average = Sum(39)m / 12 =												70.3016 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0227	1.0204	1.0181	1.0075	1.0055	0.9963	0.9963	0.9945	0.9998	1.0055	1.0095	1.0137 (40)
HLP (average)												1.0075 (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												2.2408 (42)
Average daily hot water use (litres/day)												87.4183 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.1602	92.6634	89.1667	85.6700	82.1732	78.6765	78.6765	82.1732	85.6700	89.1667	92.6634	96.1602 (44)
Energy conte	142.6027	124.7213	128.7012	112.2048	107.6632	92.9051	86.0903	98.7898	99.9697	116.5051	127.1744	138.1031 (45)
Energy content (annual)												Total = Sum(45)m = 1375.4308 (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)

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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	30.3031	26.5033	27.3490	23.8435	22.8784	19.7423	18.2942	20.9928	21.2436	24.7573	27.0246	29.3469	(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	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1114	17.8628	14.5270	10.9979	8.2210	6.9405	7.4995	9.7481	13.0839	16.6131	19.3899	20.6704	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.7831	198.8250	193.6793	182.7246	168.8962	155.8996	147.2170	145.1750	150.3207	161.2754	175.1038	188.1005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	(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)	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	(71)
Water heating gains (Table 5)	40.7300	39.4394	36.7594	33.1160	30.7506	27.4199	24.5890	28.2162	29.5049	33.2760	37.5341	39.4448	(72)
Total internal gains	314.2360	312.7388	301.5773	283.4500	264.4794	246.8716	235.9170	239.7509	249.5212	267.7760	288.6394	304.8272	(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	
Northwest				3.9800	11.2829	0.6300		0.7000	0.7700		13.7239 (81)	
Southeast				2.6900	39.9751	0.6300		0.7000	1.0000		42.6799 (82)	
Solar gains	56.4038	106.3903	170.0279	246.8761	306.0955	315.9637	299.6632	254.2488	196.7687	124.4626	69.5081	46.9700 (83)
Total gains	370.6398	419.1292	471.6052	530.3261	570.5750	562.8353	535.5802	493.9997	446.2899	392.2386	358.1475	351.7972 (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	67.9057	68.0591	68.2101	68.9285	69.0646	69.7053	69.7053	69.8252	69.4571	69.0646	68.7898	68.5049		
alpha	5.5270	5.5373	5.5473	5.5952	5.6043	5.6470	5.6470	5.6550	5.6305	5.6043	5.5860	5.5670		
util living area	0.9989	0.9976	0.9928	0.9720	0.8993	0.7350	0.5605	0.6258	0.8794	0.9855	0.9977	0.9992	(86)	
MIT	19.8681	19.9962	20.2251	20.5369	20.8073	20.9567	20.9921	20.9860	20.8769	20.5257	20.1411	19.8450	(87)	
Th 2	20.0645	20.0664	20.0683	20.0771	20.0788	20.0865	20.0865	20.0879	20.0835	20.0788	20.0754	20.0719	(88)	
util rest of house	0.9985	0.9968	0.9902	0.9611	0.8610	0.6514	0.4497	0.5120	0.8194	0.9781	0.9967	0.9989	(89)	
MIT 2	19.0244	19.1538	19.3830	19.6956	19.9452	20.0660	20.0844	20.0837	20.0119	19.6897	19.3060	19.0074	(90)	
Living area fraction														
MIT	19.2894	19.4184	19.6475	19.9599	20.2160	20.3458	20.3695	20.3671	20.2836	19.9523	19.5683	19.2705	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.2894	19.4184	19.6475	19.9599	20.2160	20.3458	20.3695	20.3671	20.2836	19.9523	19.5683	19.2705	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	369.9471	417.4433	466.2734	508.7792	494.9434	380.8120	259.6684	270.7547	372.3928	383.1112	356.7301	351.3048	(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	1069.6639	1033.7155	934.0376	777.5339	597.5142	399.4414	262.0523	275.3162	431.4140	656.1945	878.3183	1066.0429	(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	520.5893	414.1349	348.0165	193.5033	76.3126	0.0000	0.0000	0.0000	0.0000	203.1740	375.5435	531.7651	(98)
Space heating												2663.0393	(98)
Space heating per m2												38.1634	(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	653.4774	514.4397	527.4358	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8819	0.9393	0.9159	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	576.2848	483.1923	483.0731	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.9202	676.9368	633.9296	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)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	95.4975	144.1459	112.2373	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												351.8807 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.8744	36.0365	28.0593	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												87.9702 (107)
Space cooling per m2												1.2607 (108)
Energy for space heating												38.1634 (99)
Energy for space cooling												1.2607 (108)
Total												39.4240 (109)
Dwelling Fabric Energy Efficiency (DFEE)												39.4 (109)

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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	69.7800 (1b)	x 2.0700 (2b)	= 144.4446 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 144.4446 (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					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1385 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3885 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3593 (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												
	0.4581	0.4492	0.4402	0.3953	0.3863	0.3414	0.3414	0.3324	0.3593	0.3863	0.4042	0.4222 (22b)
Effective ac	0.6049	0.6009	0.5969	0.5781	0.5746	0.5583	0.5583	0.5552	0.5646	0.5746	0.5817	0.5891 (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			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			3.9800	1.3258	5.2765		(27)
TER Room Window (Uw = 1.70)			2.6900	1.5918	4.2818		(27a)
Walls	36.1100		36.1100	0.1800	6.4998		(29a)
Wall to Corridor		2.1200	3.1000	0.1800	0.5580		(29a)
Dormer	12.0000	3.9800	8.0200	0.1800	1.4436		(29a)
Pitched Roof	39.4100		39.4100	0.1300	5.1233		(30)
Sloping Ceilings	41.0700	2.6900	38.3800	0.1300	4.9894		(30)
Total net area of external elements Aum(A, m ²)			133.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.2925		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.7061 (36)
Total fabric heat loss						(33) + (36) =	39.9986 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.8358	28.6416	28.4512	27.5568	27.3895	26.6106	26.6106	26.4663	26.9106	27.3895	27.7280	28.0819 (38)
Heat transfer coeff	68.8344	68.6401	68.4497	67.5554	67.3881	66.6091	66.6091	66.4649	66.9092	67.3881	67.7266	68.0805 (39)
Average = Sum(39)m / 12 =												67.5546 (39)
HLP	0.9864	0.9837	0.9809	0.9681	0.9657	0.9546	0.9546	0.9525	0.9589	0.9657	0.9706	0.9756 (40)
HLP (average)												0.9681 (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												2.2408 (42)
Average daily hot water use (litres/day)												87.4183 (43)
Daily hot water use	96.1602	92.6634	89.1667	85.6700	82.1732	78.6765	78.6765	82.1732	85.6700	89.1667	92.6634	96.1602 (44)
Energy conte	142.6027	124.7213	128.7012	112.2048	107.6632	92.9051	86.0903	98.7898	99.9697	116.5051	127.1744	138.1031 (45)
Energy content (annual)												Total = Sum(45)m = 1375.4308 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.3031	26.5033	27.3490	23.8435	22.8784	19.7423	18.2942	20.9928	21.2436	24.7573	27.0246	29.3469 (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	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	112.0386	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1114	17.8628	14.5270	10.9979	8.2210	6.9405	7.4995	9.7481	13.0839	16.6131	19.3899	20.6704	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.7831	198.8250	193.6793	182.7246	168.8962	155.8996	147.2170	145.1750	150.3207	161.2754	175.1038	188.1005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	34.2039	(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)	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	(71)
Water heating gains (Table 5)	40.7300	39.4394	36.7594	33.1160	30.7506	27.4199	24.5890	28.2162	29.5049	33.2760	37.5341	39.4448	(72)
Total internal gains	314.2360	312.7388	301.5773	283.4500	264.4794	246.8716	235.9170	239.7509	249.5212	267.7760	288.6394	304.8272	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF		Access		Gains
						Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
Northwest				3.9800	11.2829	0.6300		0.7000		0.7700		13.7239
Southeast				2.6900	39.9751	0.6300		0.7000		1.0000		42.6799 (81)
Solar gains	56.4038	106.3903	170.0279	246.8761	306.0955	315.9637	299.6632	254.2488	196.7687	124.4626	69.5081	46.9700 (83)
Total gains	370.6398	419.1292	471.6052	530.3261	570.5750	562.8353	535.5802	493.9997	446.2899	392.2386	358.1475	351.7972 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th _{li} (C)													21.0000 (85)
Utilisation factor for gains for living area, nil _{lm} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3984	70.5977	70.7941	71.7313	71.9094	72.7503	72.7503	72.9082	72.4241	71.9094	71.5500	71.1780	
alpha	5.6932	5.7065	5.7196	5.7821	5.7940	5.8500	5.8500	5.8605	5.8283	5.7940	5.7700	5.7452	
util living area	0.9989	0.9975	0.9925	0.9696	0.8897	0.7149	0.5398	0.6042	0.8676	0.9844	0.9977	0.9992	(86)
MIT	19.9190	20.0465	20.2717	20.5779	20.8342	20.9666	20.9945	20.9898	20.8962	20.5617	20.1873	19.8988	(87)
Th 2	20.0946	20.0970	20.0993	20.1100	20.1120	20.1214	20.1214	20.1231	20.1178	20.1120	20.1079	20.1037	(88)
util rest of house	0.9986	0.9967	0.9898	0.9581	0.8500	0.6336	0.4360	0.4965	0.8063	0.9766	0.9967	0.9989	(89)
MIT 2	19.0999	19.2290	19.4548	19.7631	19.9980	20.1058	20.1199	20.1201	20.0580	19.7528	19.3788	19.0871	(90)
Living area fraction	19.3572	19.4858	19.7114	20.0190	20.2607	20.3762	20.3946	20.3933	20.3213	20.0069	19.6328	19.3421	(91)
MIT	19.3572	19.4858	19.7114	20.0190	20.2607	20.3762	20.3946	20.3933	20.3213	20.0069	19.6328	19.3421	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3572	19.4858	19.7114	20.0190	20.2607	20.3762	20.3946	20.3933	20.3213	20.0069	19.6328	19.3421	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	369.9565	417.4306	466.0872	507.3258	489.2448	370.5469	251.0968	262.1469	366.9563	382.6047	356.7185	351.3155	(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	(95)
Heat loss rate W	1036.4505	1001.1703	904.3190	751.1516	576.8859	384.7468	252.7568	265.4145	416.2637	633.9138	848.8036	1030.8810	(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	495.8716	392.2731	326.0445	175.5546	65.2049	0.0000	0.0000	0.0000	0.0000	186.9740	354.3013	505.5968	(98)
Space heating												2501.8207	(98)
Space heating per m ²												35.8530	(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	626.1259	492.9076	505.1332	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9014	0.9521	0.9320	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	564.3998	469.2731	470.7872	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.9202	676.9368	633.9296	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	104.0547	154.5018	121.3780	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												379.9345 (104)
Cooled fraction												1.0000 (105)
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	0.0000	26.0137	38.6254	30.3445	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												94.9836 (107)
Space cooling per m2												1.3612 (108)
Energy for space heating												35.8530 (99)
Energy for space cooling												1.3612 (108)
Total												37.2142 (109)
Target Fabric Energy Efficiency (TFEE)												42.8 (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	69.7800 (1b)	x 2.0700 (2b)	= 144.4446 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 144.4446 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.3000
Infiltration rate					0.2150 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1989 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2337	0.2188	0.2188	0.1989	0.2038	0.1939	0.1939	0.1889	0.1889	0.2038	0.1989	0.2038 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (25)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			3.9800	1.1450	4.5573		(27)
Roof Window (Uw = 1.40)			2.6900	1.3258	3.5663		(27a)
Walls	36.1100		36.1100	0.2700	9.7497		(29a)
Wall to Corridor	5.2200	2.1200	3.1000	0.2041	0.6327		(29a)
Dormer	12.0000	3.9800	8.0200	0.2100	1.6842		(29a)
Pitched Roof	39.4100		39.4100	0.1000	3.9410		(30)
Sloping Ceilings	41.0700	2.6900	38.3800	0.1700	6.5246		(30)
Total net area of external elements Aum(A, m ²)			133.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			32.9877	(33)
Party Wall 1			7.1100	0.0000	0.0000		(32)
Party Floor 1			57.9100				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3985 (36)
Total fabric heat loss							(33) + (36) = 43.3862 (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	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334 (38)
Heat transfer coeff	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196 (39)
Average = Sum(39)m / 12 =												67.2196 (39)
HLP	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633 (40)
HLP (average)												0.9633 (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												2.2408 (42)
Average daily hot water use (litres/day)												87.4183 (43)
Daily hot water use	96.1602	92.6634	89.1667	85.6700	82.1732	78.6765	78.6765	82.1732	85.6700	89.1667	92.6634	96.1602 (44)
Energy conte	142.6027	124.7213	128.7012	112.2048	107.6632	92.9051	86.0903	98.7898	99.9697	116.5051	127.1744	138.1031 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)												Total = Sum(45)m = 1375.4308 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.3904	18.7082	19.3052	16.8307	16.1495	13.9358	12.9135	14.8185	14.9955	17.4758	19.0762	20.7155 (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	31.2106	28.1745	31.1681	30.1343	31.1182	30.0906	31.0788	31.1043	30.1144	31.1475	30.1756	31.2024 (61)
Total heat required for water heating calculated for each month	173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500	169.3056 (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)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500	169.3056 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	55.2181	48.5134	50.5852	44.8417	43.5776	38.4136	36.3947	40.6237	40.7685	46.5248	49.8294	53.7199 (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	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.2786	44.6570	36.3175	27.4947	20.5526	17.3514	18.7488	24.3704	32.7098	41.5327	48.4748	51.6760	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.7061	296.7538	289.0736	272.7233	252.0839	232.6859	219.7268	216.6791	224.3593	240.7096	261.3489	280.7470	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	(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)	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	(71)
Water heating gains (Table 5)	74.2178	72.1926	67.9908	62.2801	58.5720	53.3522	48.9176	54.6018	56.6230	62.5333	69.2075	72.2042	(72)
Total internal gains	516.7033	512.1043	491.8827	460.9989	429.7094	401.8903	385.8940	394.1520	412.1929	443.2764	477.5320	503.1279	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W			
Northwest				3.9800	14.6130	0.6300	0.7000	0.7700	17.7744 (81)			
Southeast				2.6900	50.1759	0.6300	0.7000	1.0000	53.5709 (82)			
Solar gains	71.3453	114.9129	187.5085	273.4160	318.5592	363.4874	331.3724	293.7835	227.2666	145.2562	87.7226	56.1837 (83)
Total gains	588.0486	627.0171	679.3913	734.4149	748.2685	765.3777	717.2664	687.9355	639.4595	588.5326	565.2546	559.3116 (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	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896
alpha	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060
util living area	0.9834	0.9750	0.9440	0.8521	0.6785	0.4456	0.3090	0.3124	0.5772	0.8600	0.9637	0.9865 (86)
MIT	20.3635	20.4470	20.6386	20.8510	20.9675	20.9975	20.9998	20.9998	20.9898	20.8716	20.5976	20.3358 (87)
Th 2	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140 (88)
util rest of house	0.9783	0.9674	0.9274	0.8135	0.6134	0.3694	0.2262	0.2261	0.4913	0.8128	0.9507	0.9822 (89)
MIT 2	19.5562	19.6373	19.8199	20.0085	20.0966	20.1132	20.1140	20.1140	20.1102	20.0300	19.7844	19.5295 (90)
Living area fraction	19.8098	19.8917	20.0770	20.2732	20.3702	20.3910	20.3922	20.3922	20.3865	20.2944	20.0399	19.7828 (91)
MIT	19.8098	19.8917	20.0770	20.2732	20.3702	20.3910	20.3922	20.3922	20.3865	20.2944	20.0399	19.7828 (92)
Temperature adjustment	19.8098	19.8917	20.0770	20.2732	20.3702	20.3910	20.3922	20.3922	20.3865	20.2944	20.0399	19.7828 (93)
adjusted MIT	19.8098	19.8917	20.0770	20.2732	20.3702	20.3910	20.3922	20.3922	20.3865	20.2944	20.0399	19.7828 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9761	0.9652	0.9266	0.8210	0.6329	0.3933	0.2522	0.2532	0.5182	0.8234	0.9494	0.9802	(94)
Ext temp.	574.0110	605.1663	629.5183	602.9397	473.5774	301.0583	180.9256	174.2043	331.3940	484.5935	536.6572	548.2207	(95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Month fracti	955.1774	933.7915	838.7016	683.8372	488.7004	301.8842	180.9712	174.2491	335.1909	550.8213	768.9820	946.6374	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
RHI space heating demand	283.5878	220.8361	155.6324	58.2462	11.2515	0.0000	0.0000	0.0000	0.0000	49.2735	167.2739	296.4220	(98)
Space heating												1242.5235	(98)
RHI space heating demand												1243	(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	69.7800 (1b)	x 2.0700 (2b)	= 144.4446 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 144.4446 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.3000
Infiltration rate					0.2150 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1989 (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	0.2536	0.2486	0.2436	0.2188	0.2138	0.1889	0.1889	0.1840	0.1989	0.2138	0.2237	0.2337 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5036	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			3.9800	1.1450	4.5573		(27)
Roof Window (Uw = 1.40)			2.6900	1.3258	3.5663		(27a)
Walls	36.1100		36.1100	0.2700	9.7497		(29a)
Wall to Corridor	5.2200	2.1200	3.1000	0.2041	0.6327		(29a)
Dormer	12.0000	3.9800	8.0200	0.2100	1.6842		(29a)
Pitched Roof	39.4100		39.4100	0.1000	3.9410		(30)
Sloping Ceilings	41.0700	2.6900	38.3800	0.1700	6.5246		(30)
Total net area of external elements Aum(A, m ²)			133.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			32.9877	(33)
Party Wall 1			7.1100	0.0000	0.0000		(32)
Party Floor 1			57.9100				(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

250.0000 (35)
10.3985 (36)
(33) + (36) = 43.3862 (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	24.0033	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334	23.8334 (38)
Heat transfer coeff	67.3895	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196	67.2196 (39)
Average = Sum(39)m / 12 =												67.2337 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9657	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633	0.9633 (40)
HLP (average)												0.9635 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)

2.2408 (42)
87.4183 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.1602	92.6634	89.1667	85.6700	82.1732	78.6765	78.6765	82.1732	85.6700	89.1667	92.6634	96.1602 (44)
Energy conte	142.6027	124.7213	128.7012	112.2048	107.6632	92.9051	86.0903	98.7898	99.9697	116.5051	127.1744	138.1031 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1375.4308 (45)
Distribution loss (46)m = 0.15 x (45)m													
	21.3904	18.7082	19.3052	16.8307	16.1495	13.9358	12.9135	14.8185	14.9955	17.4758	19.0762	20.7155	(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	31.2106	28.1745	31.1681	30.1343	31.1182	30.0906	31.0788	31.1043	30.1144	31.1475	30.1756	31.2024	(61)
Total heat required for water heating calculated for each month	173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500	169.3056	(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)
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h	173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500	169.3056	(64)
Heat gains from water heating, kWh/month	55.2181	48.5134	50.5852	44.8417	43.5776	38.4136	36.3947	40.6237	40.7685	46.5248	49.8294	53.7199	(65)
Total per year (kWh/year) = Sum(64)m =												1742.1501	(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	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.2786	44.6570	36.3175	27.4947	20.5526	17.3514	18.7488	24.3704	32.7098	41.5327	48.4748	51.6760	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.7061	296.7538	289.0736	272.7233	252.0839	232.6859	219.7268	216.6791	224.3593	240.7096	261.3489	280.7470	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	(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)	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	(71)
Water heating gains (Table 5)	74.2178	72.1926	67.9908	62.2801	58.5720	53.3522	48.9176	54.6018	56.6230	62.5333	69.2075	72.2042	(72)
Total internal gains	516.7033	512.1043	491.8827	460.9989	429.7094	401.8903	385.8940	394.1520	412.1929	443.2764	477.5320	503.1279	(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
Northwest				3.9800	11.2829	0.6300	0.7000			0.7700			13.7239 (81)
Southeast				2.6900	39.9751	0.6300	0.7000			1.0000			42.6799 (82)

Solar gains	56.4038	106.3903	170.0279	246.8761	306.0955	315.9637	299.6632	254.2488	196.7687	124.4626	69.5081	46.9700 (83)	
Total gains	573.1071	618.4946	661.9106	707.8750	735.8049	717.8541	685.5572	648.4008	608.9617	567.7390	547.0401	550.0979 (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	71.9078	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	
alpha	5.7939	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	
util living area	0.9901	0.9830	0.9634	0.9053	0.7756	0.5866	0.4296	0.4735	0.7173	0.9259	0.9810	0.9921	(86)
MIT	20.2229	20.3392	20.5305	20.7597	20.9241	20.9873	20.9982	20.9969	20.9624	20.7584	20.4459	20.1870	(87)
Th 2	20.1120	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	(88)
util rest of house	0.9871	0.9780	0.9526	0.8785	0.7223	0.5109	0.3441	0.3841	0.6418	0.8987	0.9744	0.9897	(89)
MIT 2	19.4159	19.5319	19.7175	19.9302	20.0665	20.1086	20.1136	20.1132	20.0953	19.9339	19.6379	19.3821	(90)
Living area fraction	19.6694	19.7855	19.9729	20.1908	20.3359	20.3846	20.3915	20.3908	20.3677	20.1929	19.8917	19.6349	(91)
MIT	19.6694	19.7855	19.9729	20.1908	20.3359	20.3846	20.3915	20.3908	20.3677	20.1929	19.8917	19.6349	(92)
Temperature adjustment	19.6694	19.7855	19.9729	20.1908	20.3359	20.3846	20.3915	20.3908	20.3677	20.1929	19.8917	19.6349	(93)
adjusted MIT	19.6694	19.7855	19.9729	20.1908	20.3359	20.3846	20.3915	20.3908	20.3677	20.1929	19.8917	19.6349	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	564.6546	603.4628	629.1800	623.6886	541.8738	383.6902	254.3482	267.3209	404.6625	511.8250	531.9381	543.5171	(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	1035.7360	1000.5967	905.6414	758.9592	580.5031	388.8396	254.8609	268.2592	421.3122	644.8305	859.8515	1037.5296	(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	350.4846	266.8739	205.6872	97.3949	28.7402	0.0000	0.0000	0.0000	0.0000	98.9561	236.0977	367.5453	(98)
Space heating												1651.7799	(98)
Space heating per m2												(98) / (4) =	23.6713 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1821.1466 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	350.4846	266.8739	205.6872	97.3949	28.7402	0.0000	0.0000	0.0000	0.0000	98.9561	236.0977	367.5453	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	386.4218	294.2381	226.7776	107.3813	31.6871	0.0000	0.0000	0.0000	0.0000	109.1026	260.3062	405.2319	(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	173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500	169.3056	(64)
Efficiency of water heater (217)m	89.4390	89.3164	89.0439	88.4661	87.6132	87.0000	87.0000	87.0000	87.0000	88.4478	89.1831	87.0000	(216)
Fuel for water heating, kWh/month	194.3373	171.1844	179.5400	160.8967	158.4024	141.3744	134.6771	149.3037	149.5220	166.9374	176.4347	189.1690	(219)
Water heating fuel used												1971.7791	(219)
Annual totals kWh/year													
Space heating fuel - main system												1821.1466	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4900)													
mechanical ventilation fans (SFP = 0.4900)													86.3490 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													161.3490 (231)
Electricity for lighting (calculated in Appendix L)													355.1742 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4309.4488 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1821.1466	3.4800	63.3759 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1971.7791	3.4800	68.6179 (247)
Mechanical ventilation fans	86.3490	13.1900	11.3894 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	355.1742	13.1900	46.8475 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			320.1232 (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] =	1.1714 (257)
SAP value		83.6592
SAP rating (Section 12)		84 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1821.1466	0.2160	393.3677 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1971.7791	0.2160	425.9043 (264)
Space and water heating			819.2719 (265)
Pumps and fans	161.3490	0.5190	83.7401 (267)
Energy for lighting	355.1742	0.5190	184.3354 (268)
Energy saving/generation technologies			
PV Unit	-803.4200	0.5190	-416.9750 (269)
Total kg/year			670.3725 (272)
CO2 emissions per m2			9.6100 (273)
EI value			92.1737
EI rating			92 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8825 = 3.943$, stars = 4
Water heating environmental impact	$0.216 / 0.8825 = 0.2448$, 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	69.7800 (1b)	x 2.0700 (2b)	= 144.4446 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 144.4446 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =								Air changes per hour				
Pressure test							0.0000 / (5) =	0.0000 (8)				
Measured/design AP50							Yes					
Infiltration rate							4.3000					
Number of sides sheltered							0.2150 (18)	1 (19)				
Shelter factor						(20) = 1 - [0.075 x (19)] =	0.9250 (20)					
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =	0.1989 (21)					
Wind speed	Jan 4.7000	Feb 4.4000	Mar 4.4000	Apr 4.0000	May 4.1000	Jun 3.9000	Jul 3.9000	Aug 3.8000	Sep 3.8000	Oct 4.1000	Nov 4.0000	Dec 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	0.2337	0.2188	0.2188	0.1989	0.2038	0.1939	0.1939	0.1889	0.1889	0.2038	0.1989	0.2038 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			3.9800	1.1450	4.5573		(27)
Roof Window (Uw = 1.40)			2.6900	1.3258	3.5663		(27a)
Walls	36.1100		36.1100	0.2700	9.7497		(29a)
Wall to Corridor	5.2200	2.1200	3.1000	0.2041	0.6327		(29a)
Dormer	12.0000	3.9800	8.0200	0.2100	1.6842		(29a)
Pitched Roof	39.4100		39.4100	0.1000	3.9410		(30)
Sloping Ceilings	41.0700	2.6900	38.3800	0.1700	6.5246		(30)
Total net area of external elements Aum(A, m2)			133.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.9877		(33)
Party Wall 1			7.1100	0.0000	0.0000		(32)
Party Floor 1			57.9100				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3985 (36)
Total fabric heat loss						(33) + (36) =	43.3862 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2408 (42)
Average daily hot water use (litres/day)												87.4183 (43)
Daily hot water use	Jan 96.1602	Feb 92.6634	Mar 89.1667	Apr 85.6700	May 82.1732	Jun 78.6765	Jul 78.6765	Aug 82.1732	Sep 85.6700	Oct 89.1667	Nov 92.6634	Dec 96.1602 (44)
Energy conte	142.6027	124.7213	128.7012	112.2048	107.6632	92.9051	86.0903	98.7898	99.9697	116.5051	127.1744	138.1031 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy content (annual)	Total = Sum(45)m = 1375.4308 (45)										
Distribution loss (46)m = 0.15 x (45)m											
21.3904	18.7082	19.3052	16.8307	16.1495	13.9358	12.9135	14.8185	14.9955	17.4758	19.0762	20.7155 (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	31.2106	28.1745	31.1681	30.1343	31.1182	30.0906	31.0788	31.1043	30.1144	31.1475	30.1756 (61)
Total heat required for water heating calculated for each month											
173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500	169.3056 (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 (63)
Solar input (sum of months) = Sum(63)m =	0.0000 (63)										
Output from w/h											
173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500	169.3056 (64)
Heat gains from water heating, kWh/month											
55.2181	48.5134	50.5852	44.8417	43.5776	38.4136	36.3947	40.6237	40.7685	46.5248	49.8294	53.7199 (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	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	134.4463	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.2786	44.6570	36.3175	27.4947	20.5526	17.3514	18.7488	24.3704	32.7098	41.5327	48.4748	51.6760	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.7061	296.7538	289.0736	272.7233	252.0839	232.6859	219.7268	216.6791	224.3593	240.7096	261.3489	280.7470	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	50.6854	(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)	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	-89.6309	(71)
Water heating gains (Table 5)	74.2178	72.1926	67.9908	62.2801	58.5720	53.3522	48.9176	54.6018	56.6230	62.5333	69.2075	72.2042	(72)
Total internal gains	516.7033	512.1043	491.8827	460.9989	429.7094	401.8903	385.8940	394.1520	412.1929	443.2764	477.5320	503.1279	(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			
Northwest				3.9800	14.6130	0.6300	0.7000	0.7700	17.7744 (81)			
Southeast				2.6900	50.1759	0.6300	0.7000	1.0000	53.5709 (82)			
Solar gains	71.3453	114.9129	187.5085	273.4160	318.5592	363.4874	331.3724	227.2666	145.2562	87.7226	56.1837 (83)	
Total gains	588.0486	627.0171	679.3913	734.4149	748.2685	765.3777	717.2664	687.9355	639.4595	588.5326	565.2546	559.3116 (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	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896	72.0896
alpha	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060	5.8060
util living area	0.9834	0.9750	0.9440	0.8521	0.6785	0.4456	0.3090	0.3124	0.5772	0.8600	0.9637	0.9865 (86)
MIT	20.3635	20.4470	20.6386	20.8510	20.9675	20.9975	20.9998	20.9998	20.9898	20.8716	20.5976	20.3358 (87)
Th 2	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140	20.1140 (88)
util rest of house	0.9783	0.9674	0.9274	0.8135	0.6134	0.3694	0.2262	0.2261	0.4913	0.8128	0.9507	0.9822 (89)
MIT 2	19.5562	19.6373	19.8199	20.0085	20.0966	20.1132	20.1140	20.1140	20.1102	20.0300	19.7844	19.5295 (90)
Living area fraction	19.8098	19.8917	20.0770	20.2732	20.3702	20.3910	20.3922	20.3922	fLA = Living area / (4) =	20.3865	20.2944	20.0399
MIT	19.8098	19.8917	20.0770	20.2732	20.3702	20.3910	20.3922	20.3922	20.3865	20.2944	20.0399	19.7828 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8098	19.8917	20.0770	20.2732	20.3702	20.3910	20.3922	20.3922	20.3865	20.2944	20.0399	19.7828 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9761	0.9652	0.9266	0.8210	0.6329	0.3933	0.2522	0.2532	0.5182	0.8234	0.9494	0.9802	(94)
Useful gains	574.0110	605.1663	629.5183	602.9397	473.5774	301.0583	180.9256	174.2043	331.3940	484.5935	536.6572	548.2207	(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	955.1774	933.7915	838.7016	683.8372	488.7004	301.8842	180.9712	174.2491	335.1909	550.8213	768.9820	946.6374	(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	283.5878	220.8361	155.6324	58.2462	11.2515	0.0000	0.0000	0.0000	0.0000	49.2735	167.2739	296.4220	(98)
Space heating												1242.5235	(98)
Space heating per m2												(98) / (4) =	17.8063 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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 %)												90.7000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1369.9267 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	283.5878	220.8361	155.6324	58.2462	11.2515	0.0000	0.0000	0.0000	0.0000	49.2735	167.2739	296.4220 (98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000 (210)
Space heating fuel (main heating system)	312.6657	243.4797	171.5903	64.2185	12.4052	0.0000	0.0000	0.0000	0.0000	54.3258	184.4255	326.8159 (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	173.8134	152.8958	159.8693	142.3391	138.7814	122.9957	117.1691	129.8942	130.0841	147.6525	157.3500	169.3056 (64)
Efficiency of water heater (217)m	89.2575	89.1489	88.7867	88.0429	87.2670	87.0000	87.0000	87.0000	87.0000	87.8972	88.8680	87.0000 (216)
Fuel for water heating, kWh/month	194.7325	171.5060	180.0601	161.6702	159.0308	141.3744	134.6771	149.3037	149.5220	167.9832	177.0603	189.5514 (219)
Water heating fuel used												1976.4715 (219)
Annual totals kWh/year												
Space heating fuel - main system												1369.9267 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4900)												
mechanical ventilation fans (SFP = 0.4900)												86.3490 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												161.3490 (231)
Electricity for lighting (calculated in Appendix L)												355.1742 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												3862.9214 (238)

10a. Fuel costs - using BEDF prices (500)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1369.9267	3.6300	49.7283 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1976.4715	3.6300	71.7459 (247)
Mechanical ventilation fans	86.3490	19.4400	16.7862 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	355.1742	19.4400	69.0459 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	19.4400	0.0000 (252)
Total energy cost			316.8864 (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	1369.9267	0.2160	295.9042 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1976.4715	0.2160	426.9179 (264)
Space and water heating			722.8220 (265)
Pumps and fans	161.3490	0.5190	83.7401 (267)
Energy for lighting	355.1742	0.5190	184.3354 (268)
Energy saving/generation technologies			
PV Unit	-803.4200	0.5190	-416.9750 (269)
Total kg/year			573.9226 (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	1369.9267	1.2200	1671.3105 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1976.4715	1.2200	2411.2953 (264)
Space and water heating			4082.6058 (265)
Pumps and fans	161.3490	3.0700	495.3414 (267)
Energy for lighting	355.1742	3.0700	1090.3848 (268)
Energy saving/generation technologies			
PV Unit	-803.4200	3.0700	-2466.4994 (269)
Primary energy kWh/year			3201.8326 (272)
Primary energy kWh/m2/year			45.8847 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
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	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
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: (none) SAP change Cost change CO2 change

Recommended measures (none) Typical annual savings Energy efficiency Environmental impact

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 84
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 500 TEST (30 Jun 2022)
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	£100	£100	£0
Mains gas	£216	£216	£0
Space heating	£176	£176	£0
Water heating	£72	£72	£0
Lighting	£69	£69	£0
Total cost of fuels	£316	£316	£0
Total cost of uses	£317	£317	£0
Delivered energy	55 kWh/m²	55 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	46 kWh/m²	46 kWh/m²	0 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

No improvements selected / applicable

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

No improvements selected / applicable

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Flat 100	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	16 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	84 B	DER	11.78	TER	17.64
Environmental	92 A	% DER<TER	33.22		
CO ₂ Emissions (t/year)	0.57	DFEE	39.42	TREE	42.80
General Requirements Compliance	Pass	% DFEE<TFEE	7.88		

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 000006 - 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	Earthwool Loft Roll 40						
	Main construction	150	0.0400	3.7500	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Earthwool Loft Roll 40						
	Main construction	200	0.0400	5.0000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Earthwool Loft Roll 40						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 11.200 m ² K/W	Lower limit = 10.901 m ² K/W	Average = 11.050 m ² K/W
	Total correction = 0.0065 m ² K/W	U-value (unrounded) = 0.1 W/m ² 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 0647 Flat 100	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	16 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	84 B	DER	11.78	TER	17.64
Environmental	92 A	% DER<TER	33.22		
CO ₂ Emissions (t/year)	0.57	DFEE	39.42	TFEE	42.80
General Requirements Compliance	Pass	% DFEE<TFEE	7.88		

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 000007 - Pitched roof- insulated slope, flat ceiling

Roof Type: Pitched Roof, insulated slope, flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0346	
Layer 1	Tiling, concrete				
	Main construction	30	1.5000	0.0173	100.00
Layer 2	airspace/timber battens				
	Main construction	22	0.0000	0.0000	89.63
	Main construction	22	0.1375	0.1386	10.37
	Corrections - Cavity Ventilated, Emissivity: Normal				
Layer 3	Breather membrane				
	Main construction	0.5	0.0000	0.0000	100.00
Layer 4	Standard cavity				
	Main construction	50	0.6250	0.0693	87.50
	Main construction	50	0.1300	0.3331	12.50
	Corrections - Cavity Slightly ventilated, Openings Area: 1000 mm, Emissivity: Normal				
Layer 5	Celotex GA4000				
	Main construction	100	0.0220	3.9365	87.50
	Main construction	100	0.1300	0.6662	12.50
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 6	Celotex GA4000				
	Main construction	50	0.0220	1.9682	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 7	Roof space				
	Main construction	0	0.0600	0.0600	100.00
Layer 8	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

Total resistance:	Upper limit = 5.541 m ² K/W	Lower limit = 6.092 m ² K/W	Average = 5.816 m ² K/W
	Total correction = 0.0029 m ² K/W	U-value (unrounded) = 0.17 W/m ² K	

Unheated space: None

Total thickness: 265 mm

U-value: 0.17 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Flat 100	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	16 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	84 B	DER	11.78	TER	17.64
Environmental	92 A	% DER<TER	33.22		
CO ₂ Emissions (t/year)	0.57	DFEE	39.42	TFEE	42.80
General Requirements Compliance	Pass	% DFEE<TFEE	7.88		

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 Ground Floor Flats

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	102.5	0.7700	0.1331	82.81		
	Main construction	102.5	0.9407	0.1090	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Hemelite standard solid *7.3N						
	Main construction	140	0.4700	0.2979	93.43	1450	1000
	Main construction	140	0.8803	0.1590	6.57	1450	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 = 3.758 m ² K/W	Lower limit = 3.751 m ² K/W	Average = 3.754 m ² K/W
	Total correction = 0.0062 m ² K/W	U-value (unrounded) = 0.27 W/m ² K	

Unheated space: None

Total thickness: 370 mm

U-value: 0.27 W/m² K

Kappa: 113.50 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Flat 100	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	16 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	84 B	DER	11.78	TER	17.64
Environmental	92 A	% DER<TER	33.22		
CO ₂ Emissions (t/year)	0.57	DFEE	39.42	TFEE	42.80
General Requirements Compliance	Pass	% DFEE<TFEE	7.88		

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 Wall to Corridor

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	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00		
Layer 2	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 3	Hemelite standard solid *7.3N						
	Main construction	100	0.4700	0.2128	93.43		
	Main construction	100	0.8803	0.1136	6.57		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 5	Hemelite standard solid *7.3N						
	Main construction	100	0.4700	0.2128	93.43	1450	1000
	Main construction	100	0.8803	0.1136	6.57	1450	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 6	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 7	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 3.982 m ² K/W	Lower limit = 3.973 m ² K/W	Average = 3.978 m ² K/W
	Total correction = 0.0055 m ² K/W	U-value (unrounded) = 0.25 W/m ² K	

U-VALUE CALCULATOR REPORT

Unheated space: None

Total thickness: 355 mm

U-value: 0.25 W/m² K

Kappa: 113.50 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 100			Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)		
Property	16 Haines Crescent, WEST END, SO30 3LG				
SAP Rating	84 B	DER	11.78	TER	17.64
Environmental	92 A	% DER<TER	33.22		
CO ₂ Emissions (t/year)	0.57	DFEE	39.42	TFEE	42.80
General Requirements Compliance	Pass	% DFEE<TFEE	7.88		
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 East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Semi-Detached
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements				
	Ground Floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
		31.50 m	69.78 m ²	2.07 m

7.0 Living Area	21.92	m ²
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8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m ² K

9.0 External Walls				
Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Walls	Cavity Wall	0.27	36.11	36.11
Wall to Corridor	Cavity Wall	0.25	5.22	3.10
Dormer	Timber Frame	0.21	12.00	8.02

9.1 Party Walls				
Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Party Wall 1	Filled Cavity with Edge Sealing		0.00	7.11

10.0 External Roofs				
Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Roof	External Plane Roof	0.10	39.41	39.41
Sloping Ceilings	External Slope Roof	0.17	41.07	38.38

11.1 Party Floors				
Description	Construction			Area (m ²)

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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
Roof Window	Manufacturer	Roof Window	Double Low-E Soft 0.1			0.63		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Flat Entrance Door	Solid Door	[2] Wall to Corridor	North East							2.12	
Dormer	Window	[3] Dormer	North West	None	0.00					3.98	
Roof Window	Roof Window	[2] Sloping Ceilings	South East	None						2.69	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

Yes

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	0.91	0.300	No
Table K1 - Approved	E3 Sill	0.91	0.040	No
Table K1 - Approved	E4 Jamb	2.40	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	31.50	0.070	No
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	3.25	0.240	No
Table K1 - Approved	E11 Eaves (insulation at rafter level)	18.44	0.040	No
Table K1 - Approved	E12 Gable (insulation at ceiling level)	2.77	0.240	No
Table K1 - Approved	E13 Gable (insulation at rafter level)	6.36	0.040	No
Table K1 - Approved	E16 Corner (normal)	11.07	0.090	No
Table K1 - Approved	E18 Party wall between dwellings	1.14	0.060	No
Table K1 - Default	E25 Staggered party wall between dwellings	2.35	0.120	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.49	0.000	No
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	0.74	0.240	No
Table K1 - Default	P5 Party wall - Roof (insulation at rafter level)	2.13	0.080	No
Table K1 - Default	R1 Head of roof window	5.59	0.080	No
Table K1 - Default	R2 Sill of roof window	5.59	0.060	No
Table K1 - Default	R3 Jamb of roof window	11.92	0.080	No
Table K1 - Default	R6 Flat ceiling	18.44	0.060	No
Table K1 - Default	R7 Flat ceiling (inverted)	19.75	0.040	No

Y-value 0.078 W/m²K

18.0 Pressure Testing

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

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500233
Configuration	1
Manufacturer SFP	0.35
Duct Type	Rigid
Wet Rooms	1

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	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No
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23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17503	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.7	
In Summer	87.0	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	Gas/Oil, time clock	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

25.0 Main Heating 2

None

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

29.0 Hot Water Cylinder

None

32.0 Photovoltaic Unit

More Dwellings, One Block

Apportioned

803.42

kWh/Year

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

BLOCK COMPLIANCE

Calculation Type: New Build (As Built)

Block Reference	SAP 0647	Issued on Date	02/08/2022
Block Name	Moorgreen 92-100		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID E477-0001
Client	Foreman Homes, FORE		

Block Compliance Report - DER

Block Reference: SAP 0647		Block Name: Moorgreen 92-100			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
SAP 0647 Flat 92-As Built	1	71.26	17.06	21.57	20.92 %
SAP 0647 Flat 93-As Built	1	63.01	17.57	22.24	20.99 %
SAP 0647 Flat 94-As Built	1	60.8	16.09	20.95	23.19 %
SAP 0647 Flat 95-As Built	1	62	13.38	18.55	27.86 %
SAP 0647 Flat 96-As Built	1	62.8	13.75	18.87	27.13 %
SAP 0647 Flat 97-As Built	1	60.66	12.30	17.63	30.24 %
SAP 0647 Flat 98-As Built	1	65.7	12.49	18.12	31.06 %
SAP 0647 Flat 99-As Built	1	54.62	14.23	19.87	28.37 %
SAP 0647 Flat 100-As Built	1	69.78	11.78	17.64	33.22 %
Totals:	9	570.63	128.65	175.43	
Average DER = 14.30 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 19.49 kgCO ₂ /m ²		26.63 %			

Block Compliance Report - DFEE

Block Reference: SAP 0647		Block Name: Moorgreen 92-100			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
SAP 0647 Flat 92-As Built	1	71.26	61.49	64.19	4.21 %
SAP 0647 Flat 93-As Built	1	63.01	61.71	65.13	5.24 %
SAP 0647 Flat 94-As Built	1	60.8	55.10	57.90	4.84 %
SAP 0647 Flat 95-As Built	1	62	44.33	45.09	1.68 %
SAP 0647 Flat 96-As Built	1	62.8	46.27	47.46	2.49 %
SAP 0647 Flat 97-As Built	1	60.66	39.75	40.54	1.95 %
SAP 0647 Flat 98-As Built	1	65.7	41.07	43.41	5.38 %
SAP 0647 Flat 99-As Built	1	54.62	44.64	47.18	5.39 %
SAP 0647 Flat 100-As Built	1	69.78	39.42	42.80	7.88 %
Totals:	9	570.63	433.79	453.69	
Average DFEE = 48.32 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 50.55 kWh/m ² /yr		4.41 %			