



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 1 Haines Crescent , West End
Southampton, SO30 3LG

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
tobiaswhiting26@gmail.com

Report Issue Date: 30/03/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 86			Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)		
Property	1 Haines Crescent , West End, Southampton, SO30 3LG				
SAP Rating	86 B	DER	16.26	TER	20.63
Environmental	88 B	% DER<TER	21.19		
CO ₂ Emissions (t/year)	0.84	DFEE	51.26	TFEE	61.72
General Requirements Compliance	Pass	% DFEE<TFEE	16.95		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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)	20.63	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.26	kgCO ₂ /m ²	Pass
	-4.37 (-21.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.72	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	51.26	kWh/m ² /yr	
	-10.4 (-16.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.05 (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

0.30

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 East

6.94 m², No overhang

Windows facing West

7.60 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Thermal bridging ψ -value	0.030	W/m ² K
Photovoltaic array	0.76	kW

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.

THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 86	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Property	1 Haines Crescent , West End, Southampton, SO30 3LG		

SAP Rating	86 B	DER	16.26	TER	20.63
Environmental	88 B	% DER<TER	21.19		
CO ₂ Emissions (t/year)	0.84	DFEE	51.26	TFEE	61.72
General Requirements Compliance	Pass	% DFEE<TFEE	16.95		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
------------------	--	-------------	-----------

Client	Foreman Homes, FORE
--------	---------------------

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	11.58	0.61	CD0025
External wall	E3 Sill	Independently assessed	0.034	7.55	0.26	CD0027
External wall	E4 Jamb	Independently assessed	0.039	25.50	0.99	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.060	24.57	1.47	CBA302
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	24.57	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	15.82	0.95	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.93	0.48	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	20.20	1.01	CD0035

Total: **5.78** W/mK:
Y-Value: **0.030** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 86			Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)		
Property	1 Haines Crescent , West End, Southampton, SO30 3LG				
SAP Rating	86 B	DER	16.26	TER	20.63
Environmental	88 B	% DER<TER	21.19		
CO ₂ Emissions (t/year)	0.84	DFEE	51.26	TFEE	61.72
General Requirements Compliance	Pass	% DFEE<TFEE	16.95		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Detached House, total floor area 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) 20.63 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.26 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)51.3 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.05 (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: 0.30
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing East: 6.94 m², No overhang

Windows facing West: 7.60 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.030 W/m²K
Photovoltaic array 0.76 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												4.0500
Infiltration rate												0.2025 (18)
Number of sides sheltered												0 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2025 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.2582	0.2531	0.2481	0.2228	0.2177	0.1924	0.1924	0.1873	0.2025	0.2177	0.2278	0.2379 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5082	0.5031	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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.4973		(33)
GF Stud			18.4600			9.0000	166.1400 (32c)
First Floor			65.6900			9.0000	591.2100 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13003.3452 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.2943 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7806 (36)
Total fabric heat loss						(33) + (36) =	58.2778 (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	29.6151	29.3201	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Heat transfer coeff	87.8930	87.5979	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158 (39)
Average = Sum(39)m / 12 =												87.4708 (39)
HLP	1.2592	1.2550	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524 (40)
HLP (average)												1.2532 (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	2.2413 (42)
Average daily hot water use (litres/day)	87.4299 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)	
Energy content (annual)	Total = Sum (45)m =											1375.6130 (45)
Distribution loss (46)m = 0.15 x (45)m	21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182 (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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (64)
Heat gains from water heating, kWh/month	55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260 (65)
Solar input (sum of months) = Sum (63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum (64)m = 1742.3330 (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)
(66)m	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6061	15.6376	12.7173	9.6278	7.1969	6.0759	6.5653	8.5338	11.4540	14.5435	16.9744	18.0954	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.8298	198.8723	193.7253	182.7680	168.9364	155.9366	147.2520	145.2095	150.3565	161.3138	175.1454	188.1452	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	(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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	(71)
Water heating gains (Table 5)	74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124	(72)
Total internal gains	348.2811	346.3296	334.0600	314.3017	294.3306	274.9894	262.3588	267.9698	278.0585	298.0164	320.9540	338.0718	(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
East					6.9400	19.6403	0.6300	0.7000	0.7700			41.6561 (76)
West					7.6000	19.6403	0.6300	0.7000	0.7700			45.6176 (80)
Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697 (83)
Total gains	435.5548	517.0555	615.2213	724.3587	796.8708	789.4287	752.1261	688.6726	605.0607	500.5971	429.7741	409.8415 (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	41.0959	41.2343	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	
alpha	3.7397	3.7490	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	
util living area	0.9925	0.9852	0.9648	0.9089	0.7975	0.6383	0.4904	0.5490	0.7884	0.9492	0.9869	0.9940	(86)
MIT	19.2976	19.5175	19.8903	20.3424	20.7078	20.9086	20.9740	20.9604	20.7924	20.2855	19.6977	19.2528	(87)
Th 2	19.8729	19.8763	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	(88)
util rest of house	0.9905	0.9813	0.9554	0.8844	0.7449	0.5494	0.3747	0.4298	0.7133	0.9305	0.9828	0.9924	(89)
MIT 2	18.3320	18.5524	18.9206	19.3530	19.6785	19.8328	19.8704	19.8651	19.7573	19.3098	18.7346	18.2915	(90)
Living area fraction	fLA = Living area / (4) = 0.1913 (91)												
MIT	18.5167	18.7370	19.1061	19.5422	19.8754	20.0385	20.0815	20.0746	19.9552	19.4964	18.9188	18.4753	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.5167	18.7370	19.1061	19.5422	19.8754	20.0385	20.0815	20.0746	19.9552	19.4964	18.9188	18.4753	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9761	0.9472	0.8756	0.7447	0.5630	0.3965	0.4518	0.7192	0.9223	0.9780	0.9897	(94)
Useful gains	430.0066	504.6799	582.7292	634.2764	593.4384	444.4674	298.1913	311.1667	435.1557	461.6897	420.3077	405.6121	(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	1249.5466	1212.0939	1101.9684	930.2986	714.6580	475.4121	304.3391	321.2150	511.8413	777.6886	1033.1498	1247.8891	(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	609.7378	475.3822	386.3140	213.1359	90.1874	0.0000	0.0000	0.0000	0.0000	235.1032	441.2463	626.6541	(98)
Space heating	3077.7609 (98)												
Space heating per m2	(98) / (4) = 44.0940 (99)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3393.3416 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	609.7378	475.3822	386.3140	213.1359	90.1874	0.0000	0.0000	0.0000	0.0000	235.1032	441.2463	626.6541	(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)	672.2577	524.1259	425.9250	234.9900	99.4349	0.0000	0.0000	0.0000	0.0000	259.2097	486.4899	690.9086	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(64)
Efficiency of water heater	89.8523	89.7708	89.5847	89.1812	88.4207	87.0000	87.0000	87.0000	87.0000	89.2359	89.6972	87.0000	(216)
Fuel for water heating, kWh/month	193.4646	170.3364	178.4751	159.6234	156.9720	141.3886	134.6902	149.3187	149.5373	165.4805	175.4424	188.3746	(219)
Water heating fuel used												1963.1038	(219)
Annual totals kWh/year													
Space heating fuel - main system												3393.3416	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)													90.4868 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													165.4868 (231)
Electricity for lighting (calculated in Appendix L)													310.9286 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.76 * 853 * 1.00) =										-518.6422			-518.6422 (233)
Total delivered energy for all uses													5314.2186 (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	3393.3416	0.2160	732.9618 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1963.1038	0.2160	424.0304 (264)
Space and water heating			1156.9922 (265)
Pumps and fans	165.4868	0.5190	85.8876 (267)
Energy for lighting	310.9286	0.5190	161.3720 (268)
Energy saving/generation technologies			
PV Unit	-518.6422	0.5190	-269.1753 (269)
Total CO2, kg/year			1135.0765 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.2600 (273)

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

DER			16.2600 ZC1
Total Floor Area		TFA	69.8000
Assumed number of occupants		N	2.2413
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.7102 ZC2
CO2 emissions from cooking, equation (L16)			2.4755 ZC3
Total CO2 emissions			35.4457 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			35.4457 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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																2 * 10 =	20.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000	/ (5) =	0.1133 (8)	
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3633 (18)							
Number of sides sheltered										0 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =				1.0000 (20)			
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =				0.3633 (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	0.4631	0.4541	0.4450	0.3996	0.3905	0.3451	0.3451	0.3360	0.3633	0.3905	0.4087	0.4268	(22b)				
Effective ac	0.6073	0.6031	0.5990	0.5798	0.5762	0.5595	0.5595	0.5565	0.5660	0.5762	0.5835	0.5911	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			14.5400	1.3258	19.2765		(27)					
Ground Floor			34.9000	0.1300	4.5370		(28a)					
Brick and Block	124.3200	16.6600	107.6600	0.1800	19.3788		(29a)					
Pitched Roof	34.9000		34.9000	0.1300	4.5370		(30)					
Total net area of external elements Aum(A, m2)			194.1200				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.8493		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4657 (36)					
Total fabric heat loss						(33) + (36) =	59.3150 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.3883	Feb 35.1456	Mar 34.9077	Apr 33.7903	May 33.5812	Jun 32.6080	Jul 32.6080	Aug 32.4278	Sep 32.9829	Oct 33.5812	Nov 34.0042	Dec 34.4463 (38)
Heat transfer coeff	94.7033	94.4606	94.2227	93.1053	92.8962	91.9230	91.9230	91.7428	92.2979	92.8962	93.3192	93.7613 (39)
Average = Sum(39)m / 12 =												93.1043 (39)
HLP	Jan 1.3568	Feb 1.3533	Mar 1.3499	Apr 1.3339	May 1.3309	Jun 1.3169	Jul 1.3169	Aug 1.3144	Sep 1.3223	Oct 1.3309	Nov 1.3370	Dec 1.3433 (40)
HLP (average)												1.3339 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Daily hot water use	Jan 96.1729	Feb 92.6757	Mar 89.1785	Apr 85.6813	May 82.1841	Jun 78.6869	Jul 78.6869	Aug 82.1841	Sep 85.6813	Oct 89.1785	Nov 92.6757	Dec 96.1729 (44)
Energy conte	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Energy content (annual)												Total = Sum(45)m = 1375.6130 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	49.0087	42.6562	45.4444	42.2538	41.8801	38.8045	40.0980	41.8801	42.2538	45.4444	45.7031	49.0087 (61)
Solar input	191.6303	167.3940	174.1626	154.4735	149.5576	131.7220	126.1997	140.6831	142.2368	161.9649	172.8943	187.1301 (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	191.6303	167.3940	174.1626	154.4735	149.5576	131.7220	126.1997	140.6831	142.2368	161.9649	172.8943	187.1301 (64)
	59.6739	52.1394	54.1599	47.8765	46.2728	40.5962	38.6533	43.3220	43.8078	50.1042	53.7169	58.1775 (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	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6061	15.6376	12.7173	9.6278	7.1969	6.0759	6.5653	8.5338	11.4540	14.5435	16.9744	18.0954	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.8298	198.8723	193.7253	182.7680	168.9364	155.9366	147.2520	145.2095	150.3565	161.3138	175.1454	188.1452	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	(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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	(71)
Water heating gains (Table 5)	80.2068	77.5883	72.7956	66.4951	62.1946	56.3836	51.9534	58.2285	60.8441	67.3443	74.6067	78.1956	(72)
Total internal gains	354.2616	351.7171	338.8571	318.5099	297.9468	278.0150	265.3895	271.5906	282.2735	302.8205	326.3454	344.0551	(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
East					6.9400	19.6403	0.6300	0.7000			0.7700			41.6561 (76)
West					7.6000	19.6403	0.6300	0.7000			0.7700			45.6176 (80)
Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697	(83)	
Total gains	441.5353	522.4430	620.0184	728.5668	800.4870	792.4544	755.1567	692.2935	609.2757	505.4012	435.1655	415.8248	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.1832	51.3147	51.4443	52.0617	52.1789	52.7313	52.7313	52.8349	52.5172	52.1789	51.9424	51.6974	
alpha	4.4122	4.4210	4.4296	4.4708	4.4786	4.5154	4.5154	4.5223	4.5011	4.4786	4.4628	4.4465	
util living area	0.9974	0.9942	0.9833	0.9446	0.8472	0.6806	0.5203	0.5825	0.8359	0.9730	0.9949	0.9980	(86)
MIT	19.5203	19.7007	20.0178	20.4292	20.7580	20.9361	20.9849	20.9755	20.8335	20.3821	19.8755	19.4921	(87)
Th 2	19.7966	19.7993	19.8020	19.8144	19.8167	19.8276	19.8276	19.8296	19.8234	19.8167	19.8120	19.8071	(88)
util rest of house	0.9965	0.9921	0.9771	0.9237	0.7922	0.5798	0.3894	0.4474	0.7555	0.9591	0.9928	0.9973	(89)
MIT 2	17.8451	18.1098	18.5708	19.1599	19.5880	19.7872	19.8225	19.8202	19.6936	19.1080	18.3745	17.8109	(90)
Living area fraction	18.1655	18.4141	18.8475	19.4027	19.8118	20.0070	20.0448	20.0411	19.9116	19.3517	18.6616	18.1324	(91)
MIT	18.1655	18.4141	18.8475	19.4027	19.8118	20.0070	20.0448	20.0411	19.9116	19.3517	18.6616	18.1324	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1655	18.4141	18.8475	19.4027	19.8118	20.0070	20.0448	20.0411	19.9116	19.3517	18.6616	18.1324	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.1381	516.4515	601.5885	666.2854	633.9446	472.6166	312.9940	327.5283	464.6250	480.8386	430.6199	414.0756	(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	1313.1068	1276.5459	1163.4163	977.8580	753.5577	497.0241	316.6567	334.0492	536.3976	812.9983	1078.9213	1306.3206	(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	650.2327	510.7835	417.9999	224.3323	88.9921	0.0000	0.0000	0.0000	0.0000	247.1268	466.7770	663.8302	(98)
Space heating												3270.0744	(98)
Space heating per m2												46.8492	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3501.1503 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	650.2327	510.7835	417.9999	224.3323	88.9921	0.0000	0.0000	0.0000	0.0000	247.1268	466.7770	663.8302	(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)	696.1806	546.8774	447.5373	240.1844	95.2807	0.0000	0.0000	0.0000	0.0000	264.5897	499.7612	710.7390	(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	191.6303	167.3940	174.1626	154.4735	149.5576	131.7220	126.1997	140.6831	142.2368	161.9649	172.8943	187.1301	(64)
Efficiency of water heater	87.8838	87.6780	87.1751	85.9895	83.7925	80.3000	80.3000	80.3000	80.3000	86.1119	87.4278	87.9669	(216)
Fuel for water heating, kWh/month	218.0495	190.9191	199.7848	179.6423	178.4857	164.0373	157.1602	175.1968	177.1317	188.0866	197.7567	212.7278	(219)
Water heating fuel used												2238.9787	(219)
Annual totals kWh/year													
Space heating fuel - main system													3501.1503 (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)													310.9286 (232)
Total delivered energy for all uses													6126.0576 (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	3501.1503	0.2160	756.2485 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2238.9787	0.2160	483.6194 (264)
Space and water heating			1239.8679 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	310.9286	0.5190	161.3720 (268)
Total CO2, kg/m2/year			1440.1648 (272)
Emissions per m2 for space and water heating			17.7631 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3119 (272b)
Emissions per m2 for pumps and fans			0.5577 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7631 * 1.00) + 2.3119 + 0.5577, rounded to 2 d.p.			20.6300 (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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (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)					20.0000 / (5) = 0.1133 (8)
Pressure test					Yes
Measured/design AP50					4.0500
Infiltration rate					0.3158 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3158 (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	0.4026	0.3947	0.3868	0.3473	0.3394	0.3000	0.3000	0.2921	0.3158	0.3394	0.3552	0.3710 (22b)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5688 (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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.4973		(33)
GF Stud			18.4600			9.0000	166.1400 (32c)
First Floor			65.6900			9.0000	591.2100 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			9.0000	314.1000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12689.2452 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7943 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.7806 (36)
Total fabric heat loss (33) + (36) = 58.2778 (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	33.8606	33.6772	33.4974	32.6532	32.4952	31.7598	31.7598	31.6237	32.0431	32.4952	32.8148	33.1488 (38)
Heat transfer coeff	92.1384	91.9550	91.7753	90.9310	90.7730	90.0377	90.0377	89.9015	90.3209	90.7730	91.0926	91.4266 (39)
Average = Sum(39)m / 12 =												90.9302 (39)
HLP	1.3200	1.3174	1.3148	1.3027	1.3005	1.2899	1.2899	1.2880	1.2940	1.3005	1.3051	1.3098 (40)
HLP (average)												1.3027 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
Energy conte	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Energy content (annual)										Total = Sum(45)m =		1375.6130 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.3071	26.5068	27.3526	23.8467	22.8815	19.7450	18.2966	20.9956	21.2464	24.7606	27.0281	29.3508 (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	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6061	15.6376	12.7173	9.6278	7.1969	6.0759	6.5653	8.5338	11.4540	14.5435	16.9744	18.0954	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.8298	198.8723	193.7253	182.7680	168.9364	155.9366	147.2520	145.2095	150.3565	161.3138	175.1454	188.1452	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	(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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	(71)
Water heating gains (Table 5)	40.7353	39.4446	36.7643	33.1204	30.7546	27.4236	24.5922	28.2199	29.5089	33.2804	37.5391	39.4500	(72)
Total internal gains	311.7901	310.5734	299.8258	282.1351	263.5068	246.0550	235.0283	238.5821	247.9382	265.7565	286.2778	302.3095	(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	
East	6.9400				19.6403	0.6300		0.7000		0.7700		41.6561 (76)	
West	7.6000				19.6403	0.6300		0.7000		0.7700		45.6176 (80)	

Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697	(83)
Total gains	399.0639	481.2993	580.9871	692.1921	766.0471	760.4943	724.7956	659.2849	574.9404	468.3372	395.0979	374.0791	(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	38.2554	38.3317	38.4068	38.7634	38.8308	39.1480	39.1480	39.2073	39.0252	38.8308	38.6946	38.5532	
alpha	3.5504	3.5554	3.5605	3.5842	3.5887	3.6099	3.6099	3.6138	3.6017	3.5887	3.5796	3.5702	
util living area	0.9938	0.9875	0.9698	0.9200	0.8184	0.6643	0.5167	0.5782	0.8131	0.9576	0.9893	0.9951	(86)
MIT	19.1152	19.3401	19.7323	20.2322	20.6398	20.8819	20.9641	20.9463	20.7415	20.1786	19.5506	19.0751	(87)
Th 2	19.8252	19.8272	19.8292	19.8387	19.8405	19.8487	19.8487	19.8503	19.8455	19.8405	19.8369	19.8331	(88)
util rest of house	0.9922	0.9842	0.9617	0.8977	0.7678	0.5739	0.3943	0.4536	0.7409	0.9414	0.9860	0.9938	(89)
MIT 2	18.1179	18.3428	18.7312	19.2202	19.5905	19.7887	19.8376	19.8318	19.6913	19.1809	18.5607	18.0839	(90)
Living area fraction									fLA = Living area / (4) =			0.1913	(91)
MIT	18.3086	18.5336	18.9226	19.4138	19.7912	19.9978	20.0530	20.0449	19.8921	19.3717	18.7500	18.2735	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3086	18.5336	18.9226	19.4138	19.7912	19.9978	20.0530	20.0449	19.8921	19.3717	18.7500	18.2735	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9892	0.9793	0.9534	0.8877	0.7653	0.5866	0.4172	0.4762	0.7443	0.9328	0.9815	0.9914	(94)
Ext temp.	394.7730	471.3133	553.8935	614.4674	586.2716	446.0937	302.3690	313.9643	427.9503	436.8657	387.8009	370.8443	(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	1290.7332	1253.6754	1140.0915	956.0264	734.4641	486.0013	310.9043	327.6856	523.1492	796.2373	1061.2323	1286.6909	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	666.5944	525.7473	436.1313	245.9225	110.2552	0.0000	0.0000	0.0000	0.0000	267.3724	484.8706	681.3899	(98)
Space heating per m2										(98) / (4) =		48.9725	(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	846.3540	666.2787	683.2513	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8338	0.8913	0.8609	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	705.6784	593.8369	588.2146	0.0000	0.0000	0.0000	0.0000	(102)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	972.1613	928.7536	853.5295	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	191.8677	249.1780	197.3943	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												638.4400 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	47.9669	62.2945	49.3486	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												159.6100 (107)
Space cooling per m2												2.2867 (108)
Energy for space heating												48.9725 (99)
Energy for space cooling												2.2867 (108)
Total												51.2592 (109)
Dwelling Fabric Energy Efficiency (DFEE)												51.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (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							2 * 10 =	20.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						20.0000 / (5) =	0.1133 (8)				
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.3633 (18)					
Number of sides sheltered							0 (19)					
Shelter factor							(20) = 1 - [0.075 x (19)] =	1.0000 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.3633 (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	0.4631	0.4541	0.4450	0.3996	0.3905	0.3451	0.3451	0.3360	0.3633	0.3905	0.4087	0.4268 (22b)
Effective ac	0.6073	0.6031	0.5990	0.5798	0.5762	0.5595	0.5595	0.5565	0.5660	0.5762	0.5835	0.5911 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			14.5400	1.3258	19.2765		(27)					
Ground Floor			34.9000	0.1300	4.5370		(28a)					
Brick and Block	124.3200	16.6600	107.6600	0.1800	19.3788		(29a)					
Pitched Roof	34.9000		34.9000	0.1300	4.5370		(30)					
Total net area of external elements Aum(A, m2)			194.1200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	49.8493		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4657 (36)					
Total fabric heat loss						(33) + (36) =	59.3150 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.3883	Feb 35.1456	Mar 34.9077	Apr 33.7903	May 33.5812	Jun 32.6080	Jul 32.6080	Aug 32.4278	Sep 32.9829	Oct 33.5812	Nov 34.0042	Dec 34.4463 (38)
Heat transfer coeff	94.7033	94.4606	94.2227	93.1053	92.8962	91.9230	91.9230	91.7428	92.2979	92.8962	93.3192	93.7613 (39)
Average = Sum(39)m / 12 =												93.1043 (39)
HLP	Jan 1.3568	Feb 1.3533	Mar 1.3499	Apr 1.3339	May 1.3309	Jun 1.3169	Jul 1.3169	Aug 1.3144	Sep 1.3223	Oct 1.3309	Nov 1.3370	Dec 1.3433 (40)
HLP (average)												1.3339 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Daily hot water use	Jan 96.1729	Feb 92.6757	Mar 89.1785	Apr 85.6813	May 82.1841	Jun 78.6869	Jul 78.6869	Aug 82.1841	Sep 85.6813	Oct 89.1785	Nov 92.6757	Dec 96.1729 (44)
Energy conte	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Energy content (annual)												Total = Sum(45)m = 1375.6130 (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	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.3071	26.5068	27.3526	23.8467	22.8815	19.7450	18.2966	20.9956	21.2464	24.7606	27.0281	29.3508 (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	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	112.0630	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6061	15.6376	12.7173	9.6278	7.1969	6.0759	6.5653	8.5338	11.4540	14.5435	16.9744	18.0954	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.8298	198.8723	193.7253	182.7680	168.9364	155.9366	147.2520	145.2095	150.3565	161.3138	175.1454	188.1452	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	34.2063	(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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	(71)
Water heating gains (Table 5)	40.7353	39.4446	36.7643	33.1204	30.7546	27.4236	24.5922	28.2199	29.5089	33.2804	37.5391	39.4500	(72)
Total internal gains	311.7901	310.5734	299.8258	282.1351	263.5068	246.0550	235.0283	238.5821	247.9382	265.7565	286.2778	302.3095	(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
East					6.9400	19.6403	0.6300	0.7000			0.7700			41.6561 (76)
West					7.6000	19.6403	0.6300	0.7000			0.7700			45.6176 (80)
Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697 (83)		
Total gains	399.0639	481.2993	580.9871	692.1921	766.0471	760.4943	724.7956	659.2849	574.9404	468.3372	395.0979	374.0791 (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	51.1832	51.3147	51.4443	52.0617	52.1789	52.7313	52.7313	52.8349	52.5172	52.1789	51.9424	51.6974	
alpha	4.4122	4.4210	4.4296	4.4708	4.4786	4.5154	4.5154	4.5223	4.5011	4.4786	4.4628	4.4465	
util living area	0.9983	0.9958	0.9869	0.9530	0.8630	0.7010	0.5396	0.6066	0.8574	0.9795	0.9965	0.9987	(86)
MIT	19.4658	19.6486	19.9707	20.3922	20.7358	20.9279	20.9825	20.9712	20.8123	20.3391	19.8245	19.4382	(87)
Th 2	19.7966	19.7993	19.8020	19.8144	19.8167	19.8276	19.8276	19.8296	19.8234	19.8167	19.8120	19.8071	(88)
util rest of house	0.9977	0.9943	0.9819	0.9347	0.8109	0.6001	0.4050	0.4683	0.7820	0.9685	0.9951	0.9983	(89)
MIT 2	18.4099	18.5942	18.9154	19.3337	19.6437	19.7960	19.8235	19.8219	19.7208	19.2923	18.7800	18.3905	(90)
Living area fraction									fLA = Living area / (4) =			0.1913	(91)
MIT	18.6119	18.7958	19.1173	19.5362	19.8526	20.0125	20.0452	20.0417	19.9295	19.4925	18.9798	18.5909	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6119	18.7958	19.1173	19.5362	19.8526	20.0125	20.0452	20.0417	19.9295	19.4925	18.9798	18.5909	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9968	0.9925	0.9781	0.9293	0.8128	0.6174	0.4310	0.4949	0.7901	0.9643	0.9935	0.9976	(94)
Ext temp.	397.7839	477.6717	568.2690	643.2762	622.6212	469.5099	312.4048	326.2970	454.2546	451.6211	392.5440	373.1776	(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	1355.3812	1312.6091	1188.8327	990.2850	757.3459	497.5334	316.6911	334.0999	538.0527	826.0770	1108.6094	1349.3078	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	712.4524	561.0779	461.6994	249.8463	100.2352	0.0000	0.0000	0.0000	0.0000	278.5952	515.5671	726.2409	(98)
Space heating per m2										(98) / (4) =		3605.7145	(98)
												51.6578	(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	864.0763	680.2303	697.2452	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8634	0.9201	0.8909	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	746.0331	625.8604	621.2026	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	972.1613	928.7536	853.5295	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	162.8123	225.3526	172.8512	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												561.0161	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	40.7031	56.3381	43.2128	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											140.2540 (107)
Space cooling per m2											2.0094 (108)
Energy for space heating											51.6578 (99)
Energy for space cooling											2.0094 (108)
Total											53.6672 (109)
Target Fabric Energy Efficiency (TFEE)											61.7 (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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (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					4.0500
Infiltration rate					0.2025 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2025 (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	0.2379	0.2228	0.2228	0.2025	0.2076	0.1974	0.1974	0.1924	0.1924	0.2076	0.2025	0.2076 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.4973		(33)
GF Stud			18.4600			9.0000	166.1400 (32c)
First Floor			65.6900			9.0000	591.2100 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13003.3452 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.2943 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7806 (36)
Total fabric heat loss						(33) + (36) =	58.2778 (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	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Heat transfer coeff	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158 (39)
Average = Sum(39)m / 12 =												87.4158 (39)
HLP	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524 (40)
HLP (average)												1.2524 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729	(44)
Energy content (annual)	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214	(45)
Distribution loss	(46)m = 0.15 x	(45)m								Total = Sum(45)m =		1375.6130	(45)
	21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182	(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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025	(61)
Total heat required for water heating calculated for each month													
Solar input	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h								Solar input	(sum of months) = Sum(63)m =			0.0000	(63)
	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(64)
								Total per year (kWh/year) = Sum(64)m =				1742.3330	(64)
RHI water heating demand												1742	(64)
Heat gains from water heating, kWh/month													
	55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260	(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	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.0152	39.0939	31.7933	24.0696	17.9923	15.1898	16.4132	21.3344	28.6350	36.3588	42.4360	45.2385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.7759	296.8243	289.1423	272.7881	252.1439	232.7412	219.7790	216.7306	224.4126	240.7668	261.4110	280.8137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888 (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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504 (71)
Water heating gains (Table 5)	74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124 (72)
Total internal gains	510.5313	506.6331	487.4480	457.6587	427.2285	399.8030	383.6289	391.1866	408.1908	438.1798	471.5764	496.7785 (73)

6. Solar gains

[Jan]												Gains	
	Area				Solar flux		Specific data		FF		Access		W
	m2				Table 6a		g		or Table 6c		factor		
					W/m2		or Table 6b		or Table 6c		Table 6d		
East	6.9400				25.1733		0.6300		0.7000		0.7700		53.3913 (76)
West	7.6000				25.1733		0.6300		0.7000		0.7700		58.4689 (80)
Solar gains	111.8602	186.1437	311.0982	453.1011	520.4461	588.5912	538.7456	484.3497	377.9988	238.1263	139.0199	87.0706	(83)
Total gains	622.3915	692.7767	798.5463	910.7597	947.6746	988.3941	922.3745	875.5364	786.1896	676.3061	610.5963	583.8491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202
alpha	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547
util living area	0.9695	0.9548	0.9099	0.8071	0.6513	0.4383	0.3100	0.3165	0.5783	0.8411	0.9458	0.9744 (86)
MIT	19.7770	19.9302	20.2677	20.6415	20.8792	20.9793	20.9958	20.9957	20.9426	20.6557	20.1662	19.7346 (87)
Th 2	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783 (88)
util rest of house	0.9618	0.9437	0.8883	0.7639	0.5802	0.3473	0.2060	0.2071	0.4790	0.7918	0.9298	0.9678 (89)
MIT 2	18.8089	18.9573	19.2790	19.6165	19.8081	19.8709	19.8777	19.8777	19.8538	19.6405	19.1898	18.7680 (90)
Living area fraction									fLA = Living area / (4) =			0.1913 (91)
MIT	18.9941	19.1434	19.4681	19.8126	20.0130	20.0829	20.0915	20.0915	20.0621	19.8347	19.3766	18.9529 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9941	19.1434	19.4681	19.8126	20.0130	20.0829	20.0915	20.0915	20.0621	19.8347	19.3766	18.9529 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9540	0.9347	0.8789	0.7611	0.5893	0.3643	0.2260	0.2281	0.4962	0.7896	0.9209	0.9606 (94)
Ext temp.	593.7925	647.5320	701.8645	693.1991	558.4791	360.0957	208.4424	199.7056	390.1217	533.9969	562.2757	560.8635 (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	1170.8549	1148.9411	1037.4614	849.0309	604.3013	365.6522	209.0570	200.3140	407.5391	676.1311	942.0428	1158.5096 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	429.3344	336.9469	249.6841	112.1989	34.0917	0.0000	0.0000	0.0000	0.0000	105.7478	273.4324	444.6487 (98)
RHI space heating demand												1986.0848 (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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (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					4.0500
Infiltration rate					0.2025 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2025 (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	0.2582	0.2531	0.2481	0.2228	0.2177	0.1924	0.1924	0.1873	0.2025	0.2177	0.2278	0.2379 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5082	0.5031	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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.4973		(33)
GF Stud			18.4600			9.0000	166.1400 (32c)
First Floor			65.6900			9.0000	591.2100 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13003.3452 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.2943 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7806 (36)
Total fabric heat loss						(33) + (36) =	58.2778 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	29.6151	29.3201	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Average = Sum(39)m / 12 =	87.8930	87.5979	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2592	1.2550	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Energy content (annual)										Total = Sum (45)m =		1375.6130 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182	(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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month												
173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(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												
173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(64)
Heat gains from water heating, kWh/month												
55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
44.0152	39.0939	31.7933	24.0696	17.9923	15.1898	16.4132	21.3344	28.6350	36.3588	42.4360	45.2385	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
293.7759	296.8243	289.1423	272.7881	252.1439	232.7412	219.7790	216.7306	224.4126	240.7668	261.4110	280.8137	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	(71)
Water heating gains (Table 5)												
74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124	(72)
Total internal gains												
510.5313	506.6331	487.4480	457.6587	427.2285	399.8030	383.6289	391.1866	408.1908	438.1798	471.5764	496.7785	(73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access		Gains
				m2	Table 6a	Table 6b		Table 6c		factor		W
					W/m2					Table 6d		
East				6.9400	19.6403	0.6300		0.7000		0.7700		41.6561
West				7.6000	19.6403	0.6300		0.7000		0.7700		45.6176
Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697 (83)
Total gains	597.8051	677.3590	768.6093	867.7156	929.7687	914.2423	873.3962	811.8894	735.1930	640.7605	580.3964	568.5482 (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	41.0959	41.2343	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202
alpha	3.7397	3.7490	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547
util living area												
	0.9791	0.9657	0.9337	0.8600	0.7337	0.5704	0.4288	0.4768	0.7055	0.9021	0.9664	0.9824 (86)
MIT	19.5492	19.7557	20.0946	20.4871	20.7847	20.9374	20.9834	20.9752	20.8609	20.4548	19.9229	19.5017 (87)
Th 2	19.8729	19.8763	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783 (88)
util rest of house												
	0.9741	0.9576	0.9180	0.8275	0.6760	0.4847	0.3247	0.3686	0.6239	0.8714	0.9570	0.9782 (89)
MIT 2	18.5800	18.7849	19.1145	19.4805	19.7362	19.8483	19.8735	19.8704	19.8019	19.4622	18.9537	18.5374 (90)
Living area fraction												
MIT	18.7654	18.9705	19.3019	19.6730	19.9367	20.0566	20.0858	20.0817	20.0045	19.6521	19.1390	18.7219 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7654	18.9705	19.3019	19.6730	19.9367	20.0566	20.0858	20.0817	20.0045	19.6521	19.1390	18.7219 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9676	0.9493	0.9082	0.8207	0.6793	0.4990	0.3445	0.3889	0.6340	0.8640	0.9490	0.9723 (94)
Useful gains	578.4231	643.0150	698.0508	712.1541	631.5997	456.2221	300.8785	315.7468	466.0872	553.6102	550.7827	552.8213 (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												
	1271.4053	1232.5492	1119.0926	941.7301	720.0183	476.9928	304.7099	321.8409	516.1431	791.2958	1052.4022	1269.4397 (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												
	515.5788	396.1670	313.2552	165.2947	65.7834	0.0000	0.0000	0.0000	0.0000	176.8381	361.1661	533.1641 (98)
Space heating												2527.2473 (98)
Space heating per m2												(98) / (4) = 36.2070 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2786.3807 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	515.5788	396.1670	313.2552	165.2947	65.7834	0.0000	0.0000	0.0000	0.0000	176.8381	361.1661	533.1641	(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)	568.4441	436.7883	345.3750	182.2433	72.5286	0.0000	0.0000	0.0000	0.0000	194.9704	398.1985	587.8325	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(64)
Efficiency of water heater	89.7377	89.6383	89.4150	88.9496	88.1564	87.0000	87.0000	87.0000	87.0000	88.9780	89.5443	87.0000	(216)
(217)m	89.7377	89.6383	89.4150	88.9496	88.1564	87.0000	87.0000	87.0000	87.0000	88.9780	89.5443	89.7797	(217)
Fuel for water heating, kWh/month	193.7116	170.5881	178.8139	160.0390	157.4426	141.3886	134.6902	149.3187	149.5373	165.9601	175.7420	188.5994	(219)
Water heating fuel used												1965.8316	(219)
Annual totals kWh/year													
Space heating fuel - main system												2786.3807	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)												90.4868	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												165.4868	(231)
Electricity for lighting (calculated in Appendix L)												310.9286	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 853 * 1.00) =										-518.6422		-518.6422	(233)
Total delivered energy for all uses												4709.9855	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2786.3807	3.4800	96.9660	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1965.8316	3.4800	68.4109	(247)
Mechanical ventilation fans	90.4868	13.1900	11.9352	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	310.9286	13.1900	41.0115	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-518.6422	13.1900	-68.4089	(252)
Total energy cost			279.8073	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0237	(257)
SAP value		85.7196	
SAP rating (Section 12)		86	(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	2786.3807	0.2160	601.8582	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1965.8316	0.2160	424.6196	(264)
Space and water heating			1026.4779	(265)
Pumps and fans	165.4868	0.5190	85.8876	(267)
Energy for lighting	310.9286	0.5190	161.3720	(268)
Energy saving/generation technologies				
PV Unit	-518.6422	0.5190	-269.1753	(269)
Total kg/year			1004.5621	(272)
CO2 emissions per m2			14.3900	(273)
EI value			88.2743	
EI rating			88	(274)
EI band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, 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	$3.48 / 0.8852 = 3.931$, stars = 4
Water heating environmental impact	$0.216 / 0.8852 = 0.2440$, 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	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											4.0500	
Infiltration rate											0.2025	(18)
Number of sides sheltered											0	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2025 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
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												
	0.2379	0.2228	0.2228	0.2025	0.2076	0.1974	0.1974	0.1924	0.1924	0.2076	0.2025	0.2076 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.4973		(33)
GF Stud			18.4600			9.0000	166.1400 (32c)
First Floor			65.6900			9.0000	591.2100 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13003.3452 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.2943 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7806 (36)
Total fabric heat loss						(33) + (36) =	58.2778 (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	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Heat transfer coeff	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158 (39)
Average = Sum(39)m / 12 =												87.4158 (39)
HLP	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524 (40)
HLP (average)												1.2524 (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	2.2413 (42)
Average daily hot water use (litres/day)	87.4299 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)	
Energy content (annual)												Total = Sum(45)m = 1375.6130 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182 (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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month												
173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (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												
173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (64)	
Heat gains from water heating, kWh/month												
55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260 (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	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.0152	39.0939	31.7933	24.0696	17.9923	15.1898	16.4132	21.3344	28.6350	36.3588	42.4360	45.2385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.7759	296.8243	289.1423	272.7881	252.1439	232.7412	219.7790	216.7306	224.4126	240.7668	261.4110	280.8137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888 (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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504 (71)
Water heating gains (Table 5)	74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124 (72)
Total internal gains	510.5313	506.6331	487.4480	457.6587	427.2285	399.8030	383.6289	391.1866	408.1908	438.1798	471.5764	496.7785 (73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access		Gains
				m2	Table 6a	Specific data		Specific data		factor		W
					W/m2	or Table 6b		or Table 6c		Table 6d		
East				6.9400	25.1733	0.6300		0.7000		0.7700		53.3913 (76)
West				7.6000	25.1733	0.6300		0.7000		0.7700		58.4689 (80)
Solar gains	111.8602	186.1437	311.0982	453.1011	520.4461	588.5912	538.7456	484.3497	377.9988	238.1263	139.0199	87.0706 (83)
Total gains	622.3915	692.7767	798.5463	910.7597	947.6746	988.3941	922.3745	875.5364	786.1896	676.3061	610.5963	583.8491 (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	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202
alpha	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547
util living area												
	0.9695	0.9548	0.9099	0.8071	0.6513	0.4383	0.3100	0.3165	0.5783	0.8411	0.9458	0.9744 (86)
MIT	19.7770	19.9302	20.2677	20.6415	20.8792	20.9793	20.9958	20.9957	20.9426	20.6557	20.1662	19.7346 (87)
Th 2	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783 (88)
util rest of house												
	0.9618	0.9437	0.8883	0.7639	0.5802	0.3473	0.2060	0.2071	0.4790	0.7918	0.9298	0.9678 (89)
MIT 2	18.8089	18.9573	19.2790	19.6165	19.8081	19.8709	19.8777	19.8777	19.8538	19.6405	19.1898	18.7680 (90)
Living area fraction									fLA = Living area / (4) =			0.1913 (91)
MIT	18.9941	19.1434	19.4681	19.8126	20.0130	20.0829	20.0915	20.0915	20.0621	19.8347	19.3766	18.9529 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9941	19.1434	19.4681	19.8126	20.0130	20.0829	20.0915	20.0915	20.0621	19.8347	19.3766	18.9529 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9540	0.9347	0.8789	0.7611	0.5893	0.3643	0.2260	0.2281	0.4962	0.7896	0.9209	0.9606 (94)
Useful gains	593.7925	647.5320	701.8645	693.1991	558.4791	360.0957	208.4424	199.7056	390.1217	533.9969	562.2757	560.8635 (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												
	1170.8549	1148.9411	1037.4614	849.0309	604.3013	365.6522	209.0570	200.3140	407.5391	676.1311	942.0428	1158.5096 (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												
	429.3344	336.9469	249.6841	112.1989	34.0917	0.0000	0.0000	0.0000	0.0000	105.7478	273.4324	444.6487 (98)
Space heating												1986.0848 (98)
Space heating per m2												(98) / (4) = 28.4539 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2189.7296 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	429.3344	336.9469	249.6841	112.1989	34.0917	0.0000	0.0000	0.0000	0.0000	105.7478	273.4324	444.6487	(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)	473.3565	371.4960	275.2856	123.7033	37.5874	0.0000	0.0000	0.0000	0.0000	116.5908	301.4690	490.2411	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239	(64)
Efficiency of water heater (217)m	89.6018	89.5117	89.2188	88.5930	87.7055	87.0000	87.0000	87.0000	87.0000	88.5066	89.3125	87.0000	(216)
Fuel for water heating, kWh/month	194.0055	170.8295	179.2072	160.6833	158.2519	141.3886	134.6902	149.3187	149.5373	166.8440	176.1981	188.8753	(219)
Water heating fuel used												1969.8295	(219)
Annual totals kWh/year													
Space heating fuel - main system												2189.7296	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)												90.4868	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												165.4868	(231)
Electricity for lighting (calculated in Appendix L)												310.9286	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 966 * 1.00) =											-587.1990	-587.1990	(233)
Total delivered energy for all uses												4048.7755	(238)

10a. Fuel costs - using BEDF prices (491)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2189.7296	3.6300	79.4872 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1969.8295	3.6300	71.5048 (247)
Mechanical ventilation fans	90.4868	19.4400	17.5906 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	310.9286	19.4400	60.4445 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-587.1990	19.4400	-114.1515 (252)
Total energy cost			224.4557 (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	2189.7296	0.2160	472.9816 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1969.8295	0.2160	425.4832 (264)
Space and water heating			898.4648 (265)
Pumps and fans	165.4868	0.5190	85.8876 (267)
Energy for lighting	310.9286	0.5190	161.3720 (268)
Energy saving/generation technologies			
PV Unit	-587.1990	0.5190	-304.7563 (269)
Total kg/year			840.9681 (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	2189.7296	1.2200	2671.4701 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1969.8295	1.2200	2403.1920 (264)
Space and water heating			5074.6621 (265)
Pumps and fans	165.4868	3.0700	508.0444 (267)
Energy for lighting	310.9286	3.0700	954.5509 (268)
Energy saving/generation technologies			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

PV Unit	-587.1990	3.0700	-1802.7008 (269)
Primary energy kWh/year			4734.5565 (272)
Primary energy kWh/m2/year			67.8303 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 86
Current environmental impact rating:	B 88

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 26	-184 kg (21.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£26 2.63 kg/m²	B 87	B 90
Total Savings	£26 2.63 kg/m²		
Potential energy efficiency rating:		B 87	
Potential environmental impact rating:			B 90

Fuel prices for cost data on this page from database revision number 491 TEST (28 Feb 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	£93	£102	-£10
Mains gas	£246	£211	£35
Space heating	£207	£207	£0
Water heating	£72	£46	£26
Lighting	£60	£60	£0
Generated (PV)	-£114	-£114	£0
Total cost of fuels	£225	£199	£25
Total cost of uses	£225	£199	£26
Delivered energy	58 kWh/m²	45 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	12 kg/m²	9 kg/m²	3 kg/m²
Primary energy	68 kWh/m²	53 kWh/m²	15 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.5940 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												4.0500
Infiltration rate												0.2025 (18)
Number of sides sheltered												0 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2025 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2582	0.2531	0.2481	0.2228	0.2177	0.1924	0.1924	0.1873	0.2025	0.2177	0.2278	0.2379 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5082	0.5031	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)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.4973		(33)
GF Stud			18.4600			9.0000	166.1400 (32c)
First Floor			65.6900			9.0000	591.2100 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13003.3452 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.2943 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7806 (36)
Total fabric heat loss						(33) + (36) =	58.2778 (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	29.6151	29.3201	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380	29.1380 (38)
Heat transfer coeff	87.8930	87.5979	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158 (39)
Average = Sum(39)m / 12 =												87.4708 (39)
HLP	1.2592	1.2550	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524	1.2524 (40)
HLP (average)												1.2532 (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	2.2413 (42)
Average daily hot water use (litres/day)	87.4299 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
Energy content (annual)	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1375.6130 (45)
	21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182 (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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3184 (H8)
Utilisation factor												0.5316 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.4299 (H14)
Volume ratio Veff/V												0.8578 (H15)
Solar storage volume factor												0.9693 (H16)
Solar input	-23.8301	-39.7656	-67.7253	-90.7652	-112.1328	-110.2444	-108.7875	-95.0482	-74.4418	-50.8350	-28.2659	-821.7834 (H17)
Solar input (sum of months) = Sum (63)m =												-19.9417 (63)
												-821.7834 (63)
Output from w/h	150.0023	113.1468	92.1611	51.5888	26.6629	12.7637	8.3930	34.8591	55.6556	96.8330	129.1010	149.3822 (64)
Total per year (kWh/year) = Sum (64)m =												920.5496 (64)
Heat gains from water heating, kWh/month	55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260 (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	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.0152	39.0939	31.7933	24.0696	17.9923	15.1898	16.4132	21.3344	28.6350	36.3588	42.4360	45.2385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.7759	296.8243	289.1423	272.7881	252.1439	232.7412	219.7790	216.7306	224.4126	240.7668	261.4110	280.8137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888 (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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504 (71)
Water heating gains (Table 5)	74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124 (72)
Total internal gains	510.5313	506.6331	487.4480	457.6587	427.2285	399.8030	383.6289	391.1866	408.1908	438.1798	471.5764	496.7785 (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	
East					6.9400	19.6403	0.6300	0.7000			0.7700	41.6561 (76)	
West					7.6000	19.6403	0.6300	0.7000			0.7700	45.6176 (80)	

Solar gains	87.2737	170.7259	281.1613	410.0570	502.5402	514.4393	489.7672	420.7028	327.0022	202.5807	108.8201	71.7697 (83)	
Total gains	597.8051	677.3590	768.6093	867.7156	929.7687	914.2423	873.3962	811.8894	735.1930	640.7605	580.3964	568.5482 (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	41.0959	41.2343	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202
alpha	3.7397	3.7490	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547
util living area	0.9791	0.9657	0.9337	0.8600	0.7337	0.5704	0.4288	0.4768	0.7055	0.9021	0.9664	0.9824 (86)
MIT	19.5492	19.7557	20.0946	20.4871	20.7847	20.9374	20.9834	20.9752	20.8609	20.4548	19.9229	19.5017 (87)
Th 2	19.8729	19.8763	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783 (88)
util rest of house	0.9741	0.9576	0.9180	0.8275	0.6760	0.4847	0.3247	0.3686	0.6239	0.8714	0.9570	0.9782 (89)
MIT 2	18.5800	18.7849	19.1145	19.4805	19.7362	19.8483	19.8735	19.8704	19.8019	19.4622	18.9537	18.5374 (90)
Living area fraction										fLA = Living area / (4) =		0.1913 (91)
MIT	18.7654	18.9705	19.3019	19.6730	19.9367	20.0566	20.0858	20.0817	20.0045	19.6521	19.1390	18.7219 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7654	18.9705	19.3019	19.6730	19.9367	20.0566	20.0858	20.0817	20.0045	19.6521	19.1390	18.7219 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9676	0.9493	0.9082	0.8207	0.6793	0.4990	0.3445	0.3889	0.6340	0.8640	0.9490	0.9723	(94)
Useful gains	578.4231	643.0150	698.0508	712.1541	631.5997	456.2221	300.8785	315.7468	466.0872	553.6102	550.7827	552.8213	(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	1271.4053	1232.5492	1119.0926	941.7301	720.0183	476.9928	304.7099	321.8409	516.1431	791.2958	1052.4022	1269.4397	(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	515.5788	396.1670	313.2552	165.2947	65.7834	0.0000	0.0000	0.0000	0.0000	176.8381	361.1661	533.1641	(98)
Space heating												2527.2473	(98)
Space heating per m2											(98) / (4) =	36.2070	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2786.3807	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	515.5788	396.1670	313.2552	165.2947	65.7834	0.0000	0.0000	0.0000	0.0000	176.8381	361.1661	533.1641	(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)	568.4441	436.7883	345.3750	182.2433	72.5286	0.0000	0.0000	0.0000	0.0000	194.9704	398.1985	587.8325	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	150.0023	113.1468	92.1611	51.5888	26.6629	12.7637	8.3930	34.8591	55.6556	96.8330	129.1010	149.3822	(64)	
Efficiency of water heater	89.8389	89.8511	89.8315	89.7917	89.6010	87.0000	87.0000	87.0000	87.0000	89.3554	89.6955	87.0000	(216)	
(217)m	89.8389	89.8511	89.8315	89.7917	89.6010	87.0000	87.0000	87.0000	87.0000	89.3554	89.6955	89.8636	(217)	
Fuel for water heating, kWh/month	166.9680	125.9270	102.5933	57.4539	29.7574	14.6709	9.6471	40.0680	63.9720	108.3684	143.9325	166.2322	(219)	
Water heating fuel used												1029.5908	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2786.3807	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)														
mechanical ventilation fans (SFP = 0.4200)													90.4868	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													215.4868	(231)
Electricity for lighting (calculated in Appendix L)													310.9286	(232)
Energy saving/generation technologies (Appendices M, N and Q)														
PV Unit 0 (0.80 * 0.76 * 853 * 1.00) =										-518.6422		-518.6422	(233)	
Total delivered energy for all uses												3823.7447	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2786.3807	3.4800	96.9660	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1029.5908	3.4800	35.8298	(247)
Mechanical ventilation fans	90.4868	13.1900	11.9352	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	310.9286	13.1900	41.0115	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-518.6422	13.1900	-68.4089	(252)
Total energy cost			253.8211	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9286	(257)
SAP value		87.0458	
SAP rating (Section 12)		87	(258)
SAP band		B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2786.3807	0.2160	601.8582 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1029.5908	0.2160	222.3916 (264)
Space and water heating			824.2499 (265)
Pumps and fans	215.4868	0.5190	111.8376 (267)
Energy for lighting	310.9286	0.5190	161.3720 (268)
Energy saving/generation technologies			
PV Unit	-518.6422	0.5190	-269.1753 (269)
Total kg/year			828.2841 (272)
CO2 emissions per m2			11.8700 (273)
EI value			90.3319
EI rating			90 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	34.9000 (1b)	x 2.3900 (2b)	= 83.4110 (1b) - (3b)
First floor	34.9000 (1c)	x 2.6700 (2c)	= 93.1830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.5940 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											4.0500	
Infiltration rate											0.2025 (18)	
Number of sides sheltered											0 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2025 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
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												
	0.2379	0.2228	0.2228	0.2025	0.2076	0.1974	0.1974	0.1924	0.1924	0.2076	0.2025	0.2076 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.5400	1.1450	16.6489		(27)
Ground Floor			34.9000	0.1200	4.1880	84.0000	2931.6000 (28a)
Brick and Block	124.3200	16.6600	107.6600	0.2400	25.8384	42.2200	4545.4052 (29a)
Pitched Roof	34.9000		34.9000	0.1000	3.4900	9.1000	317.5900 (30)
Total net area of external elements Aum(A, m ²)			194.1200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.4973		(33)
GF Stud			18.4600			9.0000	166.1400 (32c)
First Floor			65.6900			9.0000	591.2100 (32c)
GF Block			42.6000			75.0000	3195.0000 (32c)
Internal Floor 1			34.9000			18.0000	628.2000 (32d)
Internal Ceiling 1			34.9000			18.0000	628.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13003.3452 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.2943 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7806 (36)
Total fabric heat loss						(33) + (36) =	58.2778 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.1380	Feb 29.1380	Mar 29.1380	Apr 29.1380	May 29.1380	Jun 29.1380	Jul 29.1380	Aug 29.1380	Sep 29.1380	Oct 29.1380	Nov 29.1380	Dec 29.1380 (38)
Heat transfer coeff	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158	87.4158 (39)
Average = Sum(39)m / 12 =												87.4158 (39)
HLP	Jan 1.2524	Feb 1.2524	Mar 1.2524	Apr 1.2524	May 1.2524	Jun 1.2524	Jul 1.2524	Aug 1.2524	Sep 1.2524	Oct 1.2524	Nov 1.2524	Dec 1.2524 (40)
HLP (average)												1.2524 (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												2.2413 (42)
Average daily hot water use (litres/day)												87.4299 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	96.1729	92.6757	89.1785	85.6813	82.1841	78.6869	78.6869	82.1841	85.6813	89.1785	92.6757	96.1729 (44)
Energy content (annual)	142.6216	124.7378	128.7182	112.2197	107.6774	92.9175	86.1017	98.8029	99.9830	116.5205	127.1912	138.1214 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1375.6130 (45)
	21.3932	18.7107	19.3077	16.8330	16.1516	13.9376	12.9153	14.8204	14.9974	17.4781	19.0787	20.7182 (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	31.2107	28.1746	31.1682	30.1344	31.1182	30.0906	31.0788	31.1044	30.1145	31.1475	30.1757	31.2025 (61)
Total heat required for water heating calculated for each month	173.8323	152.9124	159.8864	142.3541	138.7957	123.0081	117.1805	129.9073	130.0974	147.6680	157.3669	169.3239 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4729 (H8)
Utilisation factor												0.4928 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.4299 (H14)
Volume ratio Veff/V												0.8578 (H15)
Solar storage volume factor												0.9693 (H16)
Solar input												-851.0989 (H17)
Solar input	-27.7724	-39.4955	-68.5349	-92.1910	-107.1322	-116.5288	-110.4870	-100.7535	-78.8595	-54.5049	-32.8485	-21.9906 (63)
								Solar input (sum of months) =	Sum (63)m =			-851.0989 (63)
Output from w/h	146.0599	113.4168	91.3515	50.1630	31.6635	6.4793	6.6935	29.1538	51.2379	93.1631	124.5184	147.3333 (64)
								Total per year (kWh/year) =	Sum (64)m =			891.2341 (64)
Heat gains from water heating, kWh/month	55.2244	48.5190	50.5909	44.8466	43.5823	38.4177	36.3985	40.6281	40.7729	46.5299	49.8350	53.7260 (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	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756	134.4756 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.0152	39.0939	31.7933	24.0696	17.9923	15.1898	16.4132	21.3344	28.6350	36.3588	42.4360	45.2385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.7759	296.8243	289.1423	272.7881	252.1439	232.7412	219.7790	216.7306	224.4126	240.7668	261.4110	280.8137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888	50.6888 (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)	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504	-89.6504 (71)
Water heating gains (Table 5)	74.2263	72.2008	67.9985	62.2870	58.5784	53.3579	48.9227	54.6076	56.6291	62.5402	69.2153	72.2124 (72)
Total internal gains	510.5313	506.6331	487.4480	457.6587	427.2285	399.8030	383.6289	391.1866	408.1908	438.1798	471.5764	496.7785 (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	
East					6.9400	25.1733	0.6300		0.7000	0.7700		53.3913 (76)	
West					7.6000	25.1733	0.6300		0.7000	0.7700		58.4689 (80)	

Solar gains	111.8602	186.1437	311.0982	453.1011	520.4461	588.5912	538.7456	484.3497	377.9988	238.1263	139.0199	87.0706 (83)	
Total gains	622.3915	692.7767	798.5463	910.7597	947.6746	988.3941	922.3745	875.5364	786.1896	676.3061	610.5963	583.8491 (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	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202	41.3202
alpha	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547	3.7547
util living area												
	0.9695	0.9548	0.9099	0.8071	0.6513	0.4383	0.3100	0.3165	0.5783	0.8411	0.9458	0.9744 (86)
MIT	19.7770	19.9302	20.2677	20.6415	20.8792	20.9793	20.9958	20.9957	20.9426	20.6557	20.1662	19.7346 (87)
Th 2	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783	19.8783 (88)
util rest of house												
	0.9618	0.9437	0.8883	0.7639	0.5802	0.3473	0.2060	0.2071	0.4790	0.7918	0.9298	0.9678 (89)
MIT 2	18.8089	18.9573	19.2790	19.6165	19.8081	19.8709	19.8777	19.8777	19.8538	19.6405	19.1898	18.7680 (90)
Living area fraction									fLA = Living area / (4) =			0.1913 (91)
MIT	18.9941	19.1434	19.4681	19.8126	20.0130	20.0829	20.0915	20.0915	20.0621	19.8347	19.3766	18.9529 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9941	19.1434	19.4681	19.8126	20.0130	20.0829	20.0915	20.0915	20.0621	19.8347	19.3766	18.9529 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9540	0.9347	0.8789	0.7611	0.5893	0.3643	0.2260	0.2281	0.4962	0.7896	0.9209	0.9606	(94)
Useful gains	593.7925	647.5320	701.8645	693.1991	558.4791	360.0957	208.4424	199.7056	390.1217	533.9969	562.2757	560.8635	(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	1170.8549	1148.9411	1037.4614	849.0309	604.3013	365.6522	209.0570	200.3140	407.5391	676.1311	942.0428	1158.5096	(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	429.3344	336.9469	249.6841	112.1989	34.0917	0.0000	0.0000	0.0000	0.0000	105.7478	273.4324	444.6487	(98)
Space heating												1986.0848	(98)
Space heating per m2												28.4539	(99)
											(98) / (4) =		

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2189.7296 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	429.3344	336.9469	249.6841	112.1989	34.0917	0.0000	0.0000	0.0000	0.0000	105.7478	273.4324	444.6487	(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)	473.3565	371.4960	275.2856	123.7033	37.5874	0.0000	0.0000	0.0000	0.0000	116.5908	301.4690	490.2411	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	146.0599	113.4168	91.3515	50.1630	31.6635	6.4793	6.6935	29.1538	51.2379	93.1631	124.5184	147.3333	(64)
Efficiency of water heater	89.7313	89.7389	89.6784	89.5237	88.8798	87.0000	87.0000	87.0000	87.0000	88.9286	89.5089	87.0000	(216)
(217)m	89.7313	89.7389	89.6784	89.5237	88.8798	87.0000	87.0000	87.0000	87.0000	88.9286	89.5089	87.0000	(217)
Fuel for water heating, kWh/month	162.7748	126.3854	101.8657	56.0332	35.6250	7.4475	7.6936	33.5102	58.8942	104.7617	139.1129	164.1596	(219)
Water heating fuel used												998.2638	(219)
Annual totals kWh/year													
Space heating fuel - main system												2189.7296	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)													90.4868 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													215.4868 (231)
Electricity for lighting (calculated in Appendix L)													310.9286 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.76 * 966 * 1.00) =										-587.1990		-587.1990	(233)
Total delivered energy for all uses												3127.2098	(238)

10a. Fuel costs - using BEDF prices (491)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2189.7296	3.6300	79.4872	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	998.2638	3.6300	36.2370	(247)
Mechanical ventilation fans	90.4868	19.4400	17.5906	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	310.9286	19.4400	60.4445	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-587.1990	19.4400	-114.1515	(252)
Total energy cost			198.9078	(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	2189.7296	0.2160	472.9816	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	998.2638	0.2160	215.6250	(264)
Space and water heating			688.6066	(265)
Pumps and fans	215.4868	0.5190	111.8376	(267)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy for lighting	310.9286	0.5190	161.3720 (268)
Energy saving/generation technologies			
PV Unit	-587.1990	0.5190	-304.7563 (269)
Total kg/year			657.0599 (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	2189.7296	1.2200	2671.4701 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	998.2638	1.2200	1217.8818 (264)
Space and water heating			3889.3519 (265)
Pumps and fans	215.4868	3.0700	661.5444 (267)
Energy for lighting	310.9286	3.0700	954.5509 (268)
Energy saving/generation technologies			
PV Unit	-587.1990	3.0700	-1802.7008 (269)
Primary energy kWh/year			3702.7463 (272)
Primary energy kWh/m2/year			53.0479 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 86	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Project	1 Haines Crescent , West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.26	TER	20.63
Environmental	88 B	% DER<TER	21.19		
CO ₂ Emissions (t/year)	0.84	DFEE	51.26	TFEE	61.72
General Requirements Compliance	Pass	% DFEE<TFEE	16.95		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	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 Plot 86	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Project	1 Haines Crescent , West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.26	TER	20.63
Environmental	88 B	% DER<TER	21.19		
CO ₂ Emissions (t/year)	0.84	DFEE	51.26	TFEE	61.72
General Requirements Compliance	Pass	% DFEE<TFEE	16.95		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
------------------	--	-------------	-----------

Client	Foreman Homes, FORE
--------	---------------------

Building Elements

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Supabloc						
	Main construction	100	0.1100	0.9091	94.04	460	1000
	Main construction	100	0.8803	0.1136	5.96	460	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.321 m ² K/W	Lower limit = 4.110 m ² K/W	Average = 4.215 m ² K/W
	Total correction = 0.0002 m ² K/W	U-value (unrounded) = 0.24 W/m ² K	

Unheated space: None		
Total thickness: 330 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 86	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Project	1 Haines Crescent , West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.26	TER	20.63
Environmental	88 B	% DER<TER	21.19		
CO ₂ Emissions (t/year)	0.84	DFEE	51.26	TFEE	61.72
General Requirements Compliance	Pass	% DFEE<TFEE	16.95		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
------------------	--	-------------	-----------

Client	Foreman Homes, FORE
--------	---------------------

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 35.11 m², Perimeter = 16.79 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene,1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 6.953 m² K/W Lower limit = 6.953 m² K/W Average = 6.953 m² K/W

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 86	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	T (HA/SO/AR)
Property	1 Haines Crescent , West End, Southampton, SO30 3LG		
SAP Rating	86 B	DER	16.26
Environmental	88 B	TER	20.63
CO ₂ Emissions (t/year)	0.84	% DER<TER	21.19
General Requirements Compliance	Pass	DFEE	51.26
		TFEE	61.72
		% DFEE<TFEE	16.95
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	24.57 m	34.90 m ²
	1st Storey:	24.57 m	34.90 m ²
			2.39 m
			2.67 m

7.0 Living Area	13.35	m ²
-----------------	-------	----------------

8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	186.29	kJ/m²K

9.0 External Walls			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	124.32	107.66

9.1 Party Walls			U-Value	Kappa	Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)
		Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill		70.00	

9.2 Internal Walls			Kappa	Area
Description	Construction		(kJ/m ² K)	(m ²)
GF Stud	Plasterboard on timber frame		9.00	18.46
First Floor	Plasterboard on timber frame		9.00	65.69
GF Block	Dense block, plasterboard on dabs		75.00	42.60

10.0 External Roofs			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	34.90	34.90

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	34.90

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	34.90

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	34.90

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.12	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					6.94	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					7.60	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	11.58	0.053	No	CD0025
Independently assessed	E3 Sill	7.55	0.034	No	CD0027
Independently assessed	E4 Jamb	25.50	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	24.57	0.060	No	CBA302
Independently assessed	E6 Intermediate floor within a dwelling	24.57	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	15.82	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.93	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	20.20	0.050	No	CD0035

Y-value	0.030	W/m²K
---------	-------	-------

18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	5.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	Yes	
	4.05	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	4.00

Mechanical Ventilation

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500233
Configuration	2
Manufacturer SFP	0.30
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	12	
Total number of L.E.L. fittings	12	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	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

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.76	East	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£26	B 87	