



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 3 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 84			Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	H (H/A - A/R)		
Property	3 Haines Crescent, West End, Southampton, SO30 3LG				
SAP Rating	86 B	DER	14.95	TER	18.46
Environmental	88 B	% DER<TER	19.00		
CO ₂ Emissions (t/year)	0.95	DFEE	44.58	TFEE	53.66
General Requirements Compliance	Pass	% DFEE<TFEE	16.92		
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)	18.46	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.95	kgCO ₂ /m ²	Pass
	-3.51 (-19.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.66	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.58	kWh/m ² /yr	
	-9.1 (-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	4.07 (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 North

1.92 m², No overhang

Windows facing East

4.65 m², No overhang

Windows facing West

7.40 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Photovoltaic array	0.64	kW

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THERMAL BRIDGING

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SAP Rating	86 B	DER	14.95	TER	18.46
Environmental	88 B	% DER<TER	19.00		
CO ₂ Emissions (t/year)	0.95	DFEE	44.58	TFEE	53.66
General Requirements Compliance	Pass	% DFEE<TFEE	16.92		

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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	12.04	0.64	CD0025
External wall	E3 Sill	Independently assessed	0.034	9.52	0.32	CD0027
External wall	E4 Jamb	Independently assessed	0.039	28.50	1.11	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.060	18.38	1.10	CBA -302
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.38	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.70	0.58	CD0033
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.78	0.47	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	10.10	0.51	CD0035
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	10.10	0.61	CD0016
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.78	1.40	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.78	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Default	0.240	8.78	2.11	

Total: **8.86** W/mK:
Y-Value: **0.050** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Semi-Detached House, total floor area 84 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.46 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.95 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)44.6 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:	4.07 (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 North:	1.92 m ² , No overhang
Windows facing East:	4.65 m ² , No overhang
Windows facing West:	7.40 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Floor U-value	0.12 W/m ² K
Door U-value	1.10 W/m ² K
Photovoltaic array	0.64 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (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											4.0700	
Infiltration rate											0.2035 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1882 (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												
	0.2400	0.2353	0.2306	0.2071	0.2024	0.1788	0.1788	0.1741	0.1882	0.2024	0.2118	0.2212 (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)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			73.2700			9.0000	659.4300 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13224.0602 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.0181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8552 (36)
Total fabric heat loss						(33) + (36) =	54.8940 (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	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576 (38)
Heat transfer coeff	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516 (39)
Average = Sum(39)m / 12 =												90.0516 (39)
HLP	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692 (40)
HLP (average)												1.0692 (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 2.5381 (42)
Average daily hot water use (litres/day) 94.4792 (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	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (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	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (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	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (64)
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)
Total per year (kWh/year) = Sum(64)m = 1853.6100 (64)												

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	21.0623	18.7073	15.2138	11.5178	8.6097	7.2687	7.8541	10.2090	13.7025	17.3985	20.3066	21.6477 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	228.0339	230.4002	224.4373	211.7429	195.7184	180.6578	170.5963	168.2300	174.1930	186.8874	202.9118	217.9725 (68)
Pumps, fans	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Total internal gains	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998 (72)
	392.5436	390.3693	376.3711	353.8079	330.8671	308.8233	294.5540	300.6867	312.3280	335.1070	361.2536	380.8911 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				1.9200	10.6334	0.6300	0.7000	0.7700		6.2394 (74)		
East				4.6500	19.6403	0.6300	0.7000	0.7700		27.9108 (76)		
West				7.4000	19.6403	0.6300	0.7000	0.7700		44.4172 (80)		
Solar gains	78.5674	153.4127	253.2735	372.3793	460.3208	473.2743	449.7123	383.4211	295.3635	182.0822	97.8816	64.6805 (83)
Total gains	471.1110	543.7820	629.6446	726.1872	791.1879	782.0976	744.2663	684.1078	607.6915	517.1892	459.1352	445.5715 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916
util living area	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194
	0.9908	0.9836	0.9645	0.9135	0.8099	0.6553	0.5072	0.5647	0.7968	0.9476	0.9847	0.9925 (86)
MIT	19.3270	19.5240	19.8733	20.3124	20.6827	20.8970	20.9698	20.9550	20.7787	20.2798	19.7101	19.2729 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9888	0.9800	0.9566	0.8936	0.7664	0.5790	0.4052	0.4609	0.7342	0.9315	0.9807	0.9909 (89)
MIT 2	18.4930	18.6884	19.0327	19.4566	19.7947	19.9683	20.0148	20.0079	19.8849	19.4339	18.8747	18.4392 (90)
Living area fraction	18.6725	18.8682	19.2137	19.6408	19.9859	20.1683	20.2204	20.2118	20.0773	19.6160	19.0545	0.2153 (91)
MIT	18.6725	18.8682	19.2137	19.6408	19.9859	20.1683	20.2204	20.2118	20.0773	19.6160	19.0545	18.6187 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6725	18.8682	19.2137	19.6408	19.9859	20.1683	20.2204	20.2118	20.0773	19.6160	19.0545	18.6187 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9850	0.9744	0.9482	0.8843	0.7644	0.5909	0.4264	0.4818	0.7379	0.9230	0.9755	0.9876 (94)
Ext temp.	464.0671	529.8740	597.0483	642.1395	604.8091	462.1701	317.3440	329.5742	448.4253	477.3681	447.8677	440.0572 (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	1294.2717	1257.8632	1144.8874	967.2265	746.1576	501.4316	326.0243	343.2564	538.2671	811.9060	1076.5240	1298.4265 (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	617.6722	489.2087	407.5923	234.0626	105.1632	0.0000	0.0000	0.0000	0.0000	248.8962	452.6325	638.6268 (98)
Space heating per m2												3193.8546 (98)
												(98) / (4) = 37.9228 (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	3521.3392 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	617.6722	489.2087	407.5923	234.0626	105.1632	0.0000	0.0000	0.0000	0.0000	248.8962	452.6325	638.6268 (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)	681.0058	539.3701	449.3851	258.0625	115.9462	0.0000	0.0000	0.0000	0.0000	274.4170	499.0436	704.1089 (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	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (64)
Efficiency of water heater (217)m	89.8183	89.7461	89.5773	89.2096	88.5027	87.0000	87.0000	87.0000	87.0000	89.2316	89.6692	87.0000 (216)
Fuel for water heating, kWh/month	206.3766	181.6305	190.1166	169.7494	166.6681	150.0266	142.6946	158.5052	158.8347	176.0542	186.9753	200.8633 (219)
Water heating fuel used												2088.4950 (219)
Annual totals kWh/year												
Space heating fuel - main system												3521.3392 (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)												109.1804 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												184.1804 (231)
Electricity for lighting (calculated in Appendix L)												371.9662 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 + 0.64 + 908 + 1.00) =												-464.8214 (233)
Total delivered energy for all uses												5701.1594 (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	3521.3392	0.2160	760.6093 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2088.4950	0.2160	451.1149 (264)
Space and water heating			1211.7242 (265)
Pumps and fans	184.1804	0.5190	95.5897 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Energy saving/generation technologies			
PV Unit	-464.8214	0.5190	-241.2423 (269)
Total CO2, kg/year			1259.1220 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.9500 (273)

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

DER	14.9500	ZC1
Total Floor Area	84.2200	TFA
Assumed number of occupants	2.5381	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.0447	ZC2
CO2 emissions from cooking, equation (L16)	2.1362	ZC3
Total CO2 emissions	33.1309	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	33.1309	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1408 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3908 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3615 (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	0.4609	0.4519	0.4428	0.3976	0.3886	0.3434	0.3434	0.3344	0.3615	0.3886	0.4067	0.4247 (22b)
Effective ac	0.6062	0.6021	0.5980	0.5791	0.5755	0.5590	0.5590	0.5559	0.5653	0.5755	0.5827	0.5902 (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)			13.9700	1.3258	18.5208		(27)					
Ground Floor			42.1100	0.1300	5.4743		(28a)					
Brick and Block	92.9500	16.0900	76.8600	0.1800	13.8348		(29a)					
Pitched Roof	42.1100		42.1100	0.1300	5.4743		(30)					
Total net area of external elements Aum(A, m2)			177.1700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	45.4242		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8236 (36)					
Total fabric heat loss						(33) + (36) =	55.2478 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.6259	Feb 42.3359	Mar 42.0517	Apr 40.7165	May 40.4667	Jun 39.3038	Jul 39.3038	Aug 39.0885	Sep 39.7517	Oct 40.4667	Nov 40.9720	Dec 41.5004 (38)
Heat transfer coeff	97.8737	97.5837	97.2995	95.9643	95.7145	94.5516	94.5516	94.3363	94.9996	95.7145	96.2199	96.7482 (39)
Average = Sum(39)m / 12 =												95.9631 (39)
HLP	Jan 1.1621	Feb 1.1587	Mar 1.1553	Apr 1.1394	May 1.1365	Jun 1.1227	Jul 1.1227	Aug 1.1201	Sep 1.1280	Oct 1.1365	Nov 1.1425	Dec 1.1488 (40)
HLP (average)												1.1394 (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												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)
Daily hot water use	Jan 103.9272	Feb 100.1480	Mar 96.3688	Apr 92.5897	May 88.8105	Jun 85.0313	Jul 85.0313	Aug 88.8105	Sep 92.5897	Oct 96.3688	Nov 100.1480	Dec 103.9272 (44)
Energy conte	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Energy content (annual)										Total = Sum(45)m =		1486.5263 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.1085	45.6606	45.2568	41.9332	43.3310	45.2568	45.6606	49.1085	49.3151	50.9589 (61)
Solar input	205.0799	180.8226	188.2051	166.9284	161.6161	142.3425	136.3749	152.0261	153.7051	175.0238	186.7615	200.2168 (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)
	205.0799	180.8226	188.2051	166.9284	161.6161	142.3425	136.3749	152.0261	153.7051	175.0238	186.7615	200.2168 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) =	Sum (64)m =			2049.1028 (64)
	63.9850	56.3262	58.5267	51.7367	50.0037	43.8694	41.7699	46.8150	47.3399	54.1440	58.0297	62.3680 (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	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0623	18.7073	15.2138	11.5178	8.6097	7.2687	7.8541	10.2090	13.7025	17.3985	20.3066	21.6477	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.0339	230.4002	224.4373	211.7429	195.7184	180.6578	170.5963	168.2300	174.1930	186.8874	202.9118	217.9725	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	(71)
Water heating gains (Table 5)	86.0013	83.8188	78.6650	71.8565	67.2092	60.9297	56.1423	62.9234	65.7499	72.7742	80.5968	83.8279	(72)
Total internal gains	399.1686	396.9974	382.3871	359.1883	335.6085	312.9272	298.6637	305.4335	317.7165	341.1311	367.8863	387.5192	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W		
North				1.9200	10.6334	0.6300	0.7000		0.7700	6.2394 (74)		
East				4.6500	19.6403	0.6300	0.7000		0.7700	27.9108 (76)		
West				7.4000	19.6403	0.6300	0.7000		0.7700	44.4172 (80)		
Solar gains	78.5674	153.4127	253.2735	372.3793	460.3208	473.2743	449.7123	383.4211	295.3635	182.0822	97.8816	64.6805 (83)
Total gains	477.7359	550.4101	635.6606	731.5676	795.9293	786.2015	748.3760	688.8546	613.0800	523.2133	465.7679	452.1996 (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	59.7567	59.9343	60.1094	60.9457	61.1047	61.8563	61.8563	61.9975	61.5646	61.1047	60.7838	60.4519	
alpha	4.9838	4.9956	5.0073	5.0630	5.0736	5.1238	5.1238	5.1332	5.1043	5.0736	5.0523	5.0301	
util living area	0.9985	0.9965	0.9898	0.9620	0.8783	0.7116	0.5434	0.6069	0.8628	0.9815	0.9968	0.9988	(86)
MIT	19.7121	19.8615	20.1292	20.4890	20.7864	20.9489	20.9895	20.9822	20.8583	20.4613	20.0250	19.6909	(87)
Th 2	19.9504	19.9532	19.9559	19.9687	19.9712	19.9824	19.9824	19.9844	19.9780	19.9712	19.9663	19.9612	(88)
util rest of house	0.9979	0.9953	0.9860	0.9474	0.8331	0.6209	0.4242	0.4843	0.7948	0.9719	0.9955	0.9984	(89)
MIT 2	18.2311	18.4512	18.8423	19.3647	19.7606	19.9483	19.9785	19.9770	19.8614	19.3351	18.6999	18.2077	(90)
Living area fraction									fLA = Living area / (4) =			0.2153	(91)
MIT	18.5499	18.7548	19.1193	19.6067	19.9815	20.1637	20.1961	20.1934	20.0760	19.5776	18.9851	18.5270	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5499	18.7548	19.1193	19.6067	19.9815	20.1637	20.1961	20.1934	20.0760	19.5776	18.9851	18.5270	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	476.2263	546.7296	624.0928	688.3145	663.5089	501.7664	336.7350	351.7825	491.9607	505.8475	462.8029	451.1098	(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	1394.6916	1352.0006	1227.8550	1027.4649	792.6553	526.0526	340.0191	357.8544	567.7177	859.2835	1143.5874	1386.1108	(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	683.3382	541.1421	449.1991	244.1883	96.0849	0.0000	0.0000	0.0000	0.0000	262.9564	490.1648	695.6407	(98)
Space heating												3462.7145	(98)
Space heating per m2												41.1151	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3707.4031 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	683.3382	541.1421	449.1991	244.1883	96.0849	0.0000	0.0000	0.0000	0.0000	262.9564	490.1648	695.6407	(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)	731.6255	579.3813	480.9412	261.4436	102.8746	0.0000	0.0000	0.0000	0.0000	281.5379	524.8017	744.7973	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	205.0799	180.8226	188.2051	166.9284	161.6161	142.3425	136.3749	152.0261	153.7051	175.0238	186.7615	200.2168	(64)
Efficiency of water heater (217)m	87.8494	87.6392	87.1629	86.0075	83.7905	80.3000	80.3000	80.3000	80.3000	86.0737	87.3682	80.3000	(216)
Fuel for water heating, kWh/month	233.4449	206.3262	215.9233	194.0858	192.8812	177.2634	169.8318	189.3227	191.4135	203.3419	213.7638	227.7047	(219)
Water heating fuel used												2415.3032	(219)
Annual totals kWh/year													
Space heating fuel - main system												3707.4031	(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)												371.9662	(232)
Total delivered energy for all uses												6569.6724	(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	3707.4031	0.2160	800.7991 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2415.3032	0.2160	521.7055 (264)
Space and water heating			1322.5046 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Total CO2, kg/m2/year			1554.4800 (272)
Emissions per m2 for space and water heating			15.7030 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2922 (272b)
Emissions per m2 for pumps and fans			0.4622 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7030 * 1.00) + 2.2922 + 0.4622, rounded to 2 d.p.			18.4600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1408 (8)
Pressure test										Yes							
Measured/design AP50										4.0700							
Infiltration rate										0.3443 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3185 (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	0.4061	0.3981	0.3901	0.3503	0.3424	0.3025	0.3025	0.2946	0.3185	0.3424	0.3583	0.3742	(22b)				
Effective ac	0.5824	0.5792	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(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)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			73.2700			9.0000	659.4300 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			9.0000	378.9900 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 12845.0702 (34)
152.5181 (35)
8.8552 (36)
(33) + (36) = 54.8940 (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	40.9544	40.7293	40.5086	39.4723	39.2784	38.3758	38.3758	38.2087	38.7235	39.2784	39.6707	40.0807 (38)
Heat transfer coeff	95.8484	95.6233	95.4026	94.3663	94.1724	93.2698	93.2698	93.1027	93.6175	94.1724	94.5647	94.9747 (39)
Average = Sum(39)m / 12 =												94.3654 (39)
HLP	1.1381	1.1354	1.1328	1.1205	1.1182	1.1075	1.1075	1.1055	1.1116	1.1182	1.1228	1.1277 (40)
HLP (average)												1.1205 (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												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)
Daily hot water use	Jan 103.9272	Feb 100.1480	Mar 96.3688	Apr 92.5897	May 88.8105	Jun 85.0313	Jul 85.0313	Aug 88.8105	Sep 92.5897	Oct 96.3688	Nov 100.1480	Dec 103.9272 (44)
Energy conte	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Energy content (annual)										Total = Sum(45)m =		1486.5263 (45)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.7507	28.6440	29.5580	25.7694	24.7264	21.3370	19.7718	22.6885	22.9594	26.7570	29.2074	31.7173 (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	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0623	18.7073	15.2138	11.5178	8.6097	7.2687	7.8541	10.2090	13.7025	17.3985	20.3066	21.6477	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.0339	230.4002	224.4373	211.7429	195.7184	180.6578	170.5963	168.2300	174.1930	186.8874	202.9118	217.9725	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	(71)
Water heating gains (Table 5)	44.0198	42.6250	39.7285	35.7908	33.2343	29.6347	26.5750	30.4952	31.8881	35.9637	40.5658	42.6308	(72)
Total internal gains	354.1871	352.8036	340.4507	320.1226	298.6336	278.6322	266.0965	270.0054	280.8547	301.3207	324.8553	343.3220	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.9200	10.6334	0.6300	0.7000	0.7700	6.2394 (74)			
East				4.6500	19.6403	0.6300	0.7000	0.7700	27.9108 (76)			
West				7.4000	19.6403	0.6300	0.7000	0.7700	44.4172 (80)			
Solar gains	78.5674	153.4127	253.2735	372.3793	460.3208	473.2743	449.7123	383.4211	295.3635	182.0822	97.8816	64.6805 (83)
Total gains	432.7544	506.2163	593.7242	692.5019	758.9544	751.9065	715.8088	653.4265	576.2182	483.4029	422.7369	408.0025 (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	37.2262	37.3139	37.4002	37.8109	37.8887	38.2554	38.2554	38.3241	38.1133	37.8887	37.7316	37.5687	
alpha	3.4817	3.4876	3.4933	3.5207	3.5259	3.5504	3.5504	3.5549	3.5409	3.5259	3.5154	3.5046	
util living area	0.9923	0.9860	0.9696	0.9245	0.8312	0.6830	0.5364	0.5965	0.8220	0.9562	0.9873	0.9937	(86)
MIT	19.1060	19.3164	19.6921	20.1850	20.6017	20.8641	20.9570	20.9372	20.7194	20.1593	19.5435	19.0701	(87)
Th 2	19.9699	19.9720	19.9742	19.9841	19.9860	19.9948	19.9948	19.9964	19.9914	19.9860	19.9822	19.9783	(88)
util rest of house	0.9906	0.9830	0.9626	0.9064	0.7897	0.6058	0.4284	0.4881	0.7624	0.9423	0.9841	0.9924	(89)
MIT 2	18.2343	18.4450	18.8180	19.3045	19.6919	19.9171	19.9784	19.9704	19.8086	19.2896	18.6797	18.2048	(90)
Living area fraction	18.4219	18.6326	19.0062	19.4941	19.8877	20.1209	20.1891	20.1785	20.0047	19.4768	18.8657	18.3911	(91)
MIT	18.4219	18.6326	19.0062	19.4941	19.8877	20.1209	20.1891	20.1785	20.0047	19.4768	18.8657	18.3911	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4219	18.6326	19.0062	19.4941	19.8877	20.1209	20.1891	20.1785	20.0047	19.4768	18.8657	18.3911	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	427.1663	494.8625	566.4923	620.3604	595.9099	463.4118	322.3680	332.6806	439.8350	451.1433	413.8943	403.6641	(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	1353.5652	1313.1516	1193.1213	999.7234	771.0588	514.9358	334.7542	351.7918	552.7820	835.9494	1112.6157	1347.7974	(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	689.2408	549.8902	466.2120	273.1414	130.3108	0.0000	0.0000	0.0000	0.0000	286.2958	503.0794	702.4352	(98)
Space heating												3600.6055	(98)
Space heating per m2												42.7524	(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	876.7363	690.1967	707.5803	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8194	0.8795	0.8491	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	718.3763	607.0565	600.8041	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	974.1506	929.9972	858.7899	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	184.1575	240.2679	191.9414	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												616.3669 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.0394	60.0670	47.9854	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												154.0917 (107)
Space cooling per m2												1.8296 (108)
Energy for space heating												42.7524 (99)
Energy for space cooling												1.8296 (108)
Total												44.5820 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1408 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3908 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3615 (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	0.4609	0.4519	0.4428	0.3976	0.3886	0.3434	0.3434	0.3344	0.3615	0.3886	0.4067	0.4247 (22b)
Effective ac	0.6062	0.6021	0.5980	0.5791	0.5755	0.5590	0.5590	0.5559	0.5653	0.5755	0.5827	0.5902 (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)			13.9700	1.3258	18.5208		(27)					
Ground Floor			42.1100	0.1300	5.4743		(28a)					
Brick and Block	92.9500	16.0900	76.8600	0.1800	13.8348		(29a)					
Pitched Roof	42.1100		42.1100	0.1300	5.4743		(30)					
Total net area of external elements Aum(A, m2)			177.1700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.4242		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8236 (36)					
Total fabric heat loss						(33) + (36) =	55.2478 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.6259	Feb 42.3359	Mar 42.0517	Apr 40.7165	May 40.4667	Jun 39.3038	Jul 39.3038	Aug 39.0885	Sep 39.7517	Oct 40.4667	Nov 40.9720	Dec 41.5004 (38)
Heat transfer coeff	97.8737	97.5837	97.2995	95.9643	95.7145	94.5516	94.5516	94.3363	94.9996	95.7145	96.2199	96.7482 (39)
Average = Sum(39)m / 12 =												95.9631 (39)
HLP	Jan 1.1621	Feb 1.1587	Mar 1.1553	Apr 1.1394	May 1.1365	Jun 1.1227	Jul 1.1227	Aug 1.1201	Sep 1.1280	Oct 1.1365	Nov 1.1425	Dec 1.1488 (40)
HLP (average)												1.1394 (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												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy conte	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Energy content (annual)											Total = Sum(45)m =	1486.5263 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.7507	28.6440	29.5580	25.7694	24.7264	21.3370	19.7718	22.6885	22.9594	26.7570	29.2074	31.7173 (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	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037	126.9037 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0623	18.7073	15.2138	11.5178	8.6097	7.2687	7.8541	10.2090	13.7025	17.3985	20.3066	21.6477 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.0339	230.4002	224.4373	211.7429	195.7184	180.6578	170.5963	168.2300	174.1930	186.8874	202.9118	217.9725 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904	35.6904 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Water heating gains (Table 5)	44.0198	42.6250	39.7285	35.7908	33.2343	29.6347	26.5750	30.4952	31.8881	35.9637	40.5658	42.6308 (72)
Total internal gains	354.1871	352.8036	340.4507	320.1226	298.6336	278.6322	266.0965	270.0054	280.8547	301.3207	324.8553	343.3220 (73)

6. Solar gains												

[Jan]			Area	Solar flux		g		FF		Access		Gains
			m2	Table 6a		Specific data		Specific data		factor		W
				W/m2		or Table 6b		or Table 6c		Table 6d		
North			1.9200	10.6334		0.6300		0.7000		0.7700		6.2394 (74)
East			4.6500	19.6403		0.6300		0.7000		0.7700		27.9108 (76)
West			7.4000	19.6403		0.6300		0.7000		0.7700		44.4172 (80)

Solar gains	78.5674	153.4127	253.2735	372.3793	460.3208	473.2743	449.7123	383.4211	295.3635	182.0822	97.8816	64.6805 (83)
Total gains	432.7544	506.2163	593.7242	692.5019	758.9544	751.9065	715.8088	653.4265	576.2182	483.4029	422.7369	408.0025 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.7567	59.9343	60.1094	60.9457	61.1047	61.8563	61.8563	61.9975	61.5646	61.1047	60.7838	60.4519
alpha	4.9838	4.9956	5.0073	5.0630	5.0736	5.1238	5.1238	5.1332	5.1043	5.0736	5.0523	5.0301
util living area	0.9990	0.9976	0.9924	0.9692	0.8942	0.7346	0.5655	0.6344	0.8850	0.9867	0.9980	0.9993 (86)
MIT	19.6624	19.8131	20.0846	20.4525	20.7636	20.9408	20.9874	20.9782	20.8371	20.4204	19.9776	19.6418 (87)
Th 2	19.9504	19.9532	19.9559	19.9687	19.9712	19.9824	19.9824	19.9844	19.9780	19.9712	19.9663	19.9612 (88)
util rest of house	0.9987	0.9968	0.9895	0.9569	0.8525	0.6442	0.4428	0.5089	0.8228	0.9795	0.9971	0.9990 (89)
MIT 2	18.7270	18.8795	19.1518	19.5223	19.8094	19.9549	19.9791	19.9781	19.8836	19.4978	19.0546	18.7150 (90)
Living area fraction									fLA = Living area / (4) =			0.2153 (91)
MIT	18.9283	19.0805	19.3526	19.7226	20.0148	20.1671	20.1962	20.1934	20.0889	19.6964	19.2533	18.9146 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9283	19.0805	19.3526	19.7226	20.0148	20.1671	20.1962	20.1934	20.0889	19.6964	19.2533	18.9146 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9982	0.9958	0.9873	0.9532	0.8545	0.6620	0.4695	0.5361	0.8308	0.9769	0.9963	0.9987 (94)
Ext temp.	431.9771	504.0987	586.1565	660.0787	648.5444	497.7572	336.0471	350.3073	478.7347	472.2264	421.1534	407.4602 (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	1431.7287	1383.7846	1250.5551	1038.5802	795.8481	526.3825	340.0263	357.8558	568.9414	870.6559	1169.3858	1423.6068 (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	743.8152	591.1490	494.3125	272.5211	109.5940	0.0000	0.0000	0.0000	0.0000	296.4315	538.7274	756.0131 (98)
Space heating												3802.5638 (98)
Space heating per m2										(98) / (4) =		45.1504 (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	888.7854	699.6822	716.9558	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8725	0.9301	0.9023	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	775.4928	650.8024	646.9339	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	974.1506	929.9972	858.7899	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	143.0336	207.7210	157.6209	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												508.3755 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.7584	51.9302	39.4052	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												127.0939 (107)
Space cooling per m2												1.5091 (108)
Energy for space heating												45.1504 (99)
Energy for space cooling												1.5091 (108)
Total												46.6594 (109)
Target Fabric Energy Efficiency (TFEE)												53.7 (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	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (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					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					4.0700
Infiltration rate					0.2035 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1882 (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	0.2212	0.2071	0.2071	0.1882	0.1929	0.1835	0.1835	0.1788	0.1788	0.1929	0.1882	0.1929 (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)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			73.2700			9.0000	659.4300 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13224.0602 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.0181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8552 (36)
Total fabric heat loss						(33) + (36) =	54.8940 (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	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576 (38)
Average = Sum(39)m / 12 =	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692 (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												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (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 HEAT DEMAND 09 Jan 2014

Energy conte	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1486.5263 (45)
	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (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	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (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	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)
												1854 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.6557	46.7683	38.0345	28.7946	21.5243	18.1717	19.6352	25.5225	34.2563	43.4963	50.7665	54.1191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.3491	343.8809	334.9810	316.0341	292.1171	269.6384	254.6213	251.0896	259.9895	278.9364	302.8534	325.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Water heating gains (Table 5)	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998 (72)
Total internal gains	578.9091	574.3679	552.1924	517.8328	482.6372	451.1639	432.8170	441.3166	461.1352	495.7106	534.1120	563.1790 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North					1.9200	13.4684		0.6300	0.7000	0.7700		7.9030 (74)
East					4.6500	25.1733		0.6300	0.7000	0.7700		35.7737 (76)
West					7.4000	25.1733		0.6300	0.7000	0.7700		56.9302 (80)

Solar gains	100.6069	167.2773	280.6291	412.4406	477.9789	542.8970	495.9841	442.5490	342.0584	214.1549	124.9645	78.3748 (83)
Total gains	679.5160	741.6452	832.8215	930.2734	960.6160	994.0609	928.8011	883.8656	803.1936	709.8655	659.0766	641.5537 (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	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916
alpha	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194
util living area	0.9628	0.9485	0.9056	0.8087	0.6576	0.4476	0.3168	0.3226	0.5813	0.8331	0.9371	0.9680 (86)
MIT	19.8183	19.9557	20.2700	20.6302	20.8714	20.9768	20.9953	20.9951	20.9397	20.6611	20.1950	19.7792 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9551	0.9380	0.8866	0.7721	0.5968	0.3677	0.2248	0.2261	0.4959	0.7903	0.9219	0.9612 (89)
MIT 2	18.9773	19.1107	19.4121	19.7428	19.9446	20.0163	20.0250	20.0250	19.9966	19.7796	19.3463	18.9397 (90)
Living area fraction									fLA = Living area / (4) =			0.2153 (91)
MIT	19.1583	19.2926	19.5968	19.9338	20.1441	20.2231	20.2339	20.2339	20.1996	19.9693	19.5290	19.1204 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1583	19.2926	19.5968	19.9338	20.1441	20.2231	20.2339	20.2339	20.1996	19.9693	19.5290	19.1204 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9465	0.9284	0.8769	0.7683	0.6046	0.3842	0.2447	0.2469	0.5119	0.7874	0.9125	0.9531 (94)
Useful gains	643.1507	688.5483	730.3091	714.7081	580.7518	381.9638	227.2485	218.2502	411.1631	558.9718	601.3820	611.4899 (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	1220.9509	1197.0219	1080.3293	885.5507	634.3370	389.2987	228.1793	219.1731	432.2106	708.6478	984.1778	1208.5277 (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	429.8834	341.6943	260.4151	123.0067	39.8674	0.0000	0.0000	0.0000	0.0000	111.3590	275.6130	444.1961 (98)
Space heating												2026.0349 (98)
RHI space heating demand												2026 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (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																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															4.0700		
Infiltration rate															0.2035 (18)		
Number of sides sheltered															1 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.1882 (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																	
	0.2400	0.2353	0.2306	0.2071	0.2024	0.1788	0.1788	0.1741	0.1882	0.2024	0.2118	0.2212 (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)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	46.0388			(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			73.2700			9.0000	659.4300 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13224.0602 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.0181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8552 (36)
Total fabric heat loss						(33) + (36) =	54.8940 (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	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576 (38)
Heat transfer coeff	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516 (39)
Average = Sum(39)m / 12 =												90.0516 (39)
HLP	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692 (40)
HLP (average)												1.0692 (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 2.5381 (42)
Average daily hot water use (litres/day) 94.4792 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (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	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (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	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (64)
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)
Total per year (kWh/year) = Sum(64)m = 1853.6100 (64)												

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	52.6557	46.7683	38.0345	28.7946	21.5243	18.1717	19.6352	25.5225	34.2563	43.4963	50.7665	54.1191 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	340.3491	343.8809	334.9810	316.0341	292.1171	269.6384	254.6213	251.0896	259.9895	278.9364	302.8534	325.3320 (68)
Pumps, fans	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Total internal gains	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998 (72)
	578.9091	574.3679	552.1924	517.8328	482.6372	451.1639	432.8170	441.3166	461.1352	495.7106	534.1120	563.1790 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.9200	10.6334	0.6300	0.7000	0.7700	6.2394 (74)			
East				4.6500	19.6403	0.6300	0.7000	0.7700	27.9108 (76)			
West				7.4000	19.6403	0.6300	0.7000	0.7700	44.4172 (80)			
Solar gains	78.5674	153.4127	253.2735	372.3793	460.3208	473.2743	449.7123	383.4211	295.3635	182.0822	97.8816	64.6805 (83)
Total gains	657.4764	727.7806	805.4659	890.2121	942.9580	924.4382	882.5293	824.7378	756.4987	677.7928	631.9936	627.8595 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916
util living area	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194
	0.9735	0.9601	0.9292	0.8596	0.7391	0.5781	0.4361	0.4822	0.7047	0.8940	0.9594	0.9774 (86)
MIT	19.6066	19.7884	20.1010	20.4767	20.7732	20.9323	20.9817	20.9733	20.8576	20.4667	19.9589	19.5495 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9683	0.9523	0.9152	0.8320	0.6901	0.5041	0.3450	0.3882	0.6351	0.8666	0.9501	0.9729 (89)
MIT 2	18.7685	18.9467	19.2503	19.6046	19.8662	19.9895	20.0195	20.0158	19.9403	19.6043	19.1169	18.7124 (90)
Living area fraction	18.9489	19.1279	19.4334	19.7923	20.0615	20.1925	20.2266	20.2219	20.1377	19.7899	19.2981	18.8926 (92)
MIT	18.9489	19.1279	19.4334	19.7923	20.0615	20.1925	20.2266	20.2219	20.1377	19.7899	19.2981	18.8926 (93)
Temperature adjustment												0.0000
adjusted MIT	18.9489	19.1279	19.4334	19.7923	20.0615	20.1925	20.2266	20.2219	20.1377	19.7899	19.2981	18.8926 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9609	0.9434	0.9051	0.8245	0.6920	0.5173	0.3642	0.4077	0.6438	0.8589	0.9413	0.9662 (94)
Ext temp.	631.7748	686.5672	729.0345	734.0202	652.5375	478.2247	321.4368	336.2679	487.0093	582.1332	594.9235	606.6078 (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	1319.1598	1281.2441	1164.6783	980.8734	752.9666	503.6138	326.5830	344.1672	543.7082	827.5685	1098.4633	1323.0938 (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	511.4144	399.6229	324.1189	177.7343	74.7192	0.0000	0.0000	0.0000	0.0000	182.6038	362.5487	533.0656 (98)
Space heating per m2												2565.8279 (98)
												30.4658 (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												2828.9172	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	511.4144	399.6229	324.1189	177.7343	74.7192	0.0000	0.0000	0.0000	0.0000	182.6038	362.5487	533.0656	(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)	563.8527	440.5986	357.3527	195.9584	82.3806	0.0000	0.0000	0.0000	0.0000	201.3273	399.7229	587.7239	(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	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916	(64)
Efficiency of water heater	89.6853	89.5960	89.3905	88.9595	88.2099	87.0000	87.0000	87.0000	87.0000	88.9506	89.4964	89.7347	(216)
(217)m	206.6826	181.9346	190.5138	170.2267	167.2213	150.0266	142.6946	158.5052	158.8347	176.6105	187.3363	201.1392	(219)
Fuel for water heating, kWh/month	2091.7260											2091.7260	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system												2828.9172	(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)												109.1804	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												184.1804	(231)
Electricity for lighting (calculated in Appendix L)												371.9662	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.64 * 908 * 1.00) =										-464.8214		-464.8214	(233)
Total delivered energy for all uses												5011.9684	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2828.9172	3.4800	98.4463 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2091.7260	3.4800	72.7921 (247)
Mechanical ventilation fans	109.1804	13.1900	14.4009 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	371.9662	13.1900	49.0623 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-464.8214	13.1900	-61.3099 (252)
Total energy cost			303.2842 (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] =	0.9858 (257)
SAP value		86.2487
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	2828.9172	0.2160	611.0461 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.7260	0.2160	451.8128 (264)
Space and water heating			1062.8589 (265)
Pumps and fans	184.1804	0.5190	95.5897 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Energy saving/generation technologies			
PV Unit	-464.8214	0.5190	-241.2423 (269)
Total kg/year			1110.2567 (272)
CO2 emissions per m2			13.1800 (273)
EI value			88.4867
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	$3.48 / 0.8850 = 3.932$, stars = 4
Water heating environmental impact	$0.216 / 0.8850 = 0.2441$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (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											4.0700		
Infiltration rate											0.2035	(18)	
Number of sides sheltered											1	(19)	
Shelter factor									(20) = 1 - [0.075 x (19)] =		0.9250	(20)	
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =		0.1882	(21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)	
Adj infilt rate	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)	
	0.2212	0.2071	0.2071	0.1882	0.1929	0.1835	0.1835	0.1788	0.1788	0.1929	0.1882	0.1929 (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)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			73.2700			9.0000	659.4300 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13224.0602 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.0181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8552 (36)
Total fabric heat loss						(33) + (36) =	54.8940 (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	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576 (38)
Heat transfer coeff	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516 (39)
Average = Sum(39)m / 12 =												90.0516 (39)
HLP	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692 (40)
HLP (average)												1.0692 (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 2.5381 (42)
Average daily hot water use (litres/day) 94.4792 (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	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (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	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (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	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (64)
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	52.6557	46.7683	38.0345	28.7946	21.5243	18.1717	19.6352	25.5225	34.2563	43.4963	50.7665	54.1191 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	340.3491	343.8809	334.9810	316.0341	292.1171	269.6384	254.6213	251.0896	259.9895	278.9364	302.8534	325.3320 (68)
Pumps, fans	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Total internal gains	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998 (72)
	578.9091	574.3679	552.1924	517.8328	482.6372	451.1639	432.8170	441.3166	461.1352	495.7106	534.1120	563.1790 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				1.9200	13.4684	0.6300	0.7000	0.7700	7.9030 (74)			
East				4.6500	25.1733	0.6300	0.7000	0.7700	35.7737 (76)			
West				7.4000	25.1733	0.6300	0.7000	0.7700	56.9302 (80)			
Solar gains	100.6069	167.2773	280.6291	412.4406	477.9789	542.8970	495.9841	442.5490	342.0584	214.1549	124.9645	78.3748 (83)
Total gains	679.5160	741.6452	832.8215	930.2734	960.6160	994.0609	928.8011	883.8656	803.1936	709.8655	659.0766	641.5537 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916
util living area	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194
	0.9628	0.9485	0.9056	0.8087	0.6576	0.4476	0.3168	0.3226	0.5813	0.8331	0.9371	0.9680 (86)
MIT	19.8183	19.9557	20.2700	20.6302	20.8714	20.9768	20.9953	20.9951	20.9397	20.6611	20.1950	19.7792 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9551	0.9380	0.8866	0.7721	0.5968	0.3677	0.2248	0.2261	0.4959	0.7903	0.9219	0.9612 (89)
MIT 2	18.9773	19.1107	19.4121	19.7428	19.9446	20.0163	20.0250	20.0250	19.9966	19.7796	19.3463	18.9397 (90)
Living area fraction	19.1583	19.2926	19.5968	19.9338	20.1441	20.2231	20.2339	20.2339	fLA = Living area / (4) =	19.9693	19.5290	0.2153 (91)
MIT	19.1583	19.2926	19.5968	19.9338	20.1441	20.2231	20.2339	20.2339	20.1996	19.9693	19.5290	19.1204 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1583	19.2926	19.5968	19.9338	20.1441	20.2231	20.2339	20.2339	20.1996	19.9693	19.5290	19.1204 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9465	0.9284	0.8769	0.7683	0.6046	0.3842	0.2447	0.2469	0.5119	0.7874	0.9125	0.9531 (94)
Ext temp.	643.1507	688.5483	730.3091	714.7081	580.7518	381.9638	227.2485	218.2502	411.1631	558.9718	601.3820	611.4899 (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	1220.9509	1197.0219	1080.3293	885.5507	634.3370	389.2987	228.1793	219.1731	432.2106	708.6478	984.1778	1208.5277 (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	429.8834	341.6943	260.4151	123.0067	39.8674	0.0000	0.0000	0.0000	0.0000	111.3590	275.6130	444.1961 (98)
Space heating per m2												2026.0349 (98)
										(98) / (4) =		24.0565 (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													2233.7761 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	429.8834	341.6943	260.4151	123.0067	39.8674	0.0000	0.0000	0.0000	0.0000	111.3590	275.6130	444.1961	(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)	473.9618	376.7302	287.1170	135.6193	43.9552	0.0000	0.0000	0.0000	0.0000	122.7772	303.8732	489.7422	(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	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916	(64)
Efficiency of water heater (217)m	89.5525	89.4710	89.2001	88.6204	87.7617	87.0000	87.0000	87.0000	87.0000	88.4975	89.2641	89.5990	(216)
Fuel for water heating, kWh/month	206.9890	182.1888	190.9207	170.8781	168.0752	150.0266	142.6946	158.5052	158.8347	177.5145	187.8238	201.4437	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system												2233.7761	(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)													109.1804 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													184.1804 (231)
Electricity for lighting (calculated in Appendix L)													371.9662 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.64 * 1030 * 1.00) =										-527.3904			-527.3904 (233)
Total delivered energy for all uses													4358.4272 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2233.7761	3.6300	81.0861 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2095.8949	3.6300	76.0810 (247)
Mechanical ventilation fans	109.1804	19.4400	21.2247 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	371.9662	19.4400	72.3102 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-527.3904	19.4400	-102.5247 (252)
Total energy cost			257.7573 (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	2233.7761	0.2160	482.4956 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2095.8949	0.2160	452.7133 (264)
Space and water heating			935.2089 (265)
Pumps and fans	184.1804	0.5190	95.5897 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Energy saving/generation technologies			
PV Unit	-527.3904	0.5190	-273.7156 (269)
Total kg/year			950.1334 (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	2233.7761	1.2200	2725.2068 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2095.8949	1.2200	2556.9918 (264)
Space and water heating			5282.1986 (265)
Pumps and fans	184.1804	3.0700	565.4340 (267)
Energy for lighting	371.9662	3.0700	1141.9362 (268)

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Energy saving/generation technologies			
PV Unit	-527.3904	3.0700	-1619.0885 (269)
Primary energy kWh/year			5370.4802 (272)
Primary energy kWh/m2/year			63.7673 (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	+ 1.2	-£ 27	-192 kg (20.2%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£27 2.28 kg/m²	B 87	B 90
Total Savings	£27 2.28 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	£108	£118	-£10
Mains gas	£252	£216	£37
Space heating	£212	£212	£0
Water heating	£76	£49	£27
Lighting	£72	£72	£0
Generated (PV)	-£103	-£103	£0
Total cost of fuels	£257	£231	£27
Total cost of uses	£257	£230	£27
Delivered energy	52 kWh/m²	40 kWh/m²	11 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.8 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	9 kg/m²	2 kg/m²
Primary energy	64 kWh/m²	51 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (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																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															4.0700		
Infiltration rate															0.2035 (18)		
Number of sides sheltered															1 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.1882 (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																	
	0.2400	0.2353	0.2306	0.2071	0.2024	0.1788	0.1788	0.1741	0.1882	0.2024	0.2118	0.2212 (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)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			73.2700			9.0000	659.4300 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13224.0602 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.0181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8552 (36)
Total fabric heat loss						(33) + (36) =	54.8940 (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	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576	35.1576 (38)
Heat transfer coeff	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516 (39)
Average = Sum(39)m / 12 =												90.0516 (39)
HLP	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692	1.0692 (40)
HLP (average)												1.0692 (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 2.5381 (42)
Average daily hot water use (litres/day) 94.4792 (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	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1486.5263 (45)
	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (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	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (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												1.2200 (H8)
Utilisation factor												0.5594 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4792 (H14)
Volume ratio Veff/V												0.7938 (H15)
Solar storage volume factor												0.9538 (H16)
Solar input	-24.6744	-41.1744	-70.1247	-93.9810	-116.1056	-114.1503	-112.6417	-98.4157	-77.0792	-52.6360	-29.2673	-850.8985 (H17)
Solar input (sum of months) = Sum (63)m =												-20.6482 (63)
Output from w/h	160.6895	121.8318	100.1766	57.4518	31.4002	16.3729	11.5026	39.4838	61.1070	104.4600	138.3919	159.8434 (64)
Total per year (kWh/year) = Sum (64)m =												1002.7115 (64)
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.6557	46.7683	38.0345	28.7946	21.5243	18.1717	19.6352	25.5225	34.2563	43.4963	50.7665	54.1191	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.3491	343.8809	334.9810	316.0341	292.1171	269.6384	254.6213	251.0896	259.9895	278.9364	302.8534	325.3320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	(71)
Water heating gains (Table 5)	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998	(72)
Total internal gains	578.9091	574.3679	552.1924	517.8328	482.6372	451.1639	432.8170	441.3166	461.1352	495.7106	534.1120	563.1790	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.9200	10.6334	0.6300		0.7700	0.7700	6.2394	(74)
East	4.6500	19.6403	0.6300		0.7700	0.7700	27.9108	(76)
West	7.4000	19.6403	0.6300		0.7700	0.7700	44.4172	(80)

Solar gains	78.5674	153.4127	253.2735	372.3793	460.3208	473.2743	449.7123	383.4211	295.3635	182.0822	97.8816	64.6805	(83)
Total gains	657.4764	727.7806	805.4659	890.2121	942.9580	924.4382	882.5293	824.7378	756.4987	677.7928	631.9936	627.8595	(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	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	
alpha	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	
util living area	0.9735	0.9601	0.9292	0.8596	0.7391	0.5781	0.4361	0.4822	0.7047	0.8940	0.9594	0.9774	(86)
MIT	19.6066	19.7884	20.1010	20.4767	20.7732	20.9323	20.9817	20.9733	20.8576	20.4667	19.9589	19.5495	(87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	(88)
util rest of house	0.9683	0.9523	0.9152	0.8320	0.6901	0.5041	0.3450	0.3882	0.6351	0.8666	0.9501	0.9729	(89)
MIT 2	18.7685	18.9467	19.2503	19.6046	19.8662	19.9895	20.0195	20.0158	19.9403	19.6043	19.1169	18.7124	(90)
Living area fraction									fLA = Living area / (4) =			0.2153	(91)
MIT	18.9489	19.1279	19.4334	19.7923	20.0615	20.1925	20.2266	20.2219	20.1377	19.7899	19.2981	18.8926	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9489	19.1279	19.4334	19.7923	20.0615	20.1925	20.2266	20.2219	20.1377	19.7899	19.2981	18.8926	(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	0.9609	0.9434	0.9051	0.8245	0.6920	0.5173	0.3642	0.4077	0.6438	0.8589	0.9413	0.9662	(94)
Useful gains	631.7748	686.5672	729.0345	734.0202	652.5375	478.2247	321.4368	336.2679	487.0093	582.1332	594.9235	606.6078	(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	1319.1598	1281.2441	1164.6783	980.8734	752.9666	503.6138	326.5830	344.1672	543.7082	827.5685	1098.4633	1323.0938	(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	511.4144	399.6229	324.1189	177.7343	74.7192	0.0000	0.0000	0.0000	0.0000	182.6038	362.5487	533.0656	(98)
Space heating												2565.8279	(98)
Space heating per m2											(98) / (4) =	30.4658	(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													2828.9172	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	511.4144	399.6229	324.1189	177.7343	74.7192	0.0000	0.0000	0.0000	0.0000	182.6038	362.5487	533.0656	(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)	563.8527	440.5986	357.3527	195.9584	82.3806	0.0000	0.0000	0.0000	0.0000	201.3273	399.7229	587.7239	(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	160.6895	121.8318	100.1766	57.4518	31.4002	16.3729	11.5026	39.4838	61.1070	104.4600	138.3919	159.8434	(64)	
Efficiency of water heater	89.7870	89.8076	89.7983	89.7674	89.5728	87.0000	87.0000	87.0000	87.0000	89.3177	89.6467	89.8188	(216)	
(217)m	89.7870	89.8076	89.7983	89.7674	89.5728	87.0000	87.0000	87.0000	87.0000	89.3177	89.6467	89.8188	(217)	
Fuel for water heating, kWh/month	178.9674	135.6586	111.5573	64.0007	35.0554	18.8194	13.2214	45.3837	70.2379	116.9532	154.3748	177.9620	(219)	
Water heating fuel used												1122.1919	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2828.9172	(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)													109.1804	(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													234.1804	(231)
Electricity for lighting (calculated in Appendix L)													371.9662	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.64 * 908 * 1.00) =										-464.8214			-464.8214	(233)
Total delivered energy for all uses													4092.4343	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2828.9172	3.4800	98.4463	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1122.1919	3.4800	39.0523	(247)
Mechanical ventilation fans	109.1804	13.1900	14.4009	(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	371.9662	13.1900	49.0623	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-464.8214	13.1900	-61.3099	(252)
Total energy cost			276.1394	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		0.8975	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	87.4795	
SAP rating (Section 12)		87	(258)
SAP band		B	

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Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2828.9172	0.2160	611.0461	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1122.1919	0.2160	242.3935	(264)
Space and water heating			853.4396	(265)
Pumps and fans	234.1804	0.5190	121.5397	(267)
Energy for lighting	371.9662	0.5190	193.0504	(268)
Energy saving/generation technologies				
PV Unit	-464.8214	0.5190	-241.2423	(269)
Total kg/year			926.7874	(272)
CO2 emissions per m2			11.0000	(273)
EI value			90.3893	
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	42.1100 (1b)	x 2.3900 (2b)	= 100.6429 (1b) - (3b)
First floor	42.1100 (1c)	x 2.6700 (2c)	= 112.4337 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0766 (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											4.0700	
Infiltration rate											0.2035	(18)
Number of sides sheltered											1	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =		0.9250	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =		0.1882	(21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Adj infilt rate	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
	0.2212	0.2071	0.2071	0.1882	0.1929	0.1835	0.1835	0.1788	0.1788	0.1929	0.1882	0.1929 (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)			13.9700	1.1450	15.9962		(27)
Ground Floor			42.1100	0.1200	5.0532	84.0000	3537.2400 (28a)
Brick and Block	92.9500	16.0900	76.8600	0.2400	18.4464	42.2200	3245.0292 (29a)
Pitched Roof	42.1100		42.1100	0.1000	4.2110	9.1000	383.2010 (30)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.0388		(33)
Party Wall 1			44.3400	0.0000	0.0000	70.0000	3103.8000 (32)
GF Stud			73.2700			9.0000	659.4300 (32c)
First Floor			86.6000			9.0000	779.4000 (32c)
Internal Floor 1			42.1100			18.0000	757.9800 (32d)
Internal Ceiling 1			42.1100			18.0000	757.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13224.0602 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.0181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8552 (36)
Total fabric heat loss						(33) + (36) =	54.8940 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.1576	Feb 35.1576	Mar 35.1576	Apr 35.1576	May 35.1576	Jun 35.1576	Jul 35.1576	Aug 35.1576	Sep 35.1576	Oct 35.1576	Nov 35.1576	Dec 35.1576 (38)
Heat transfer coeff	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516	90.0516 (39)
Average = Sum(39)m / 12 =												90.0516 (39)
HLP	Jan 1.0692	Feb 1.0692	Mar 1.0692	Apr 1.0692	May 1.0692	Jun 1.0692	Jul 1.0692	Aug 1.0692	Sep 1.0692	Oct 1.0692	Nov 1.0692	Dec 1.0692 (40)
HLP (average)												1.0692 (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												2.5381 (42)
Average daily hot water use (litres/day)												94.4792 (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 EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	103.9272	100.1480	96.3688	92.5897	88.8105	85.0313	85.0313	88.8105	92.5897	96.3688	100.1480	103.9272 (44)
Energy content (annual)	154.1210	134.7952	139.0966	121.2678	116.3593	100.4092	93.0439	106.7692	108.0444	125.9153	137.4464	149.2579 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1486.5263 (45)
	23.1181	20.2193	20.8645	18.1902	17.4539	15.0614	13.9566	16.0154	16.2067	18.8873	20.6170	22.3887 (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	31.2429	28.2110	31.2048	30.1650	31.1464	30.1139	31.1004	31.1303	30.1418	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3639	163.0062	170.3013	151.4328	147.5057	130.5231	124.1443	137.8995	138.1862	157.0960	167.6593	180.4916 (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												1.3630 (H8)
Utilisation factor												0.5199 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4792 (H14)
Volume ratio Veff/V												0.7938 (H15)
Solar storage volume factor												0.9538 (H16)
Solar input	-28.8261	-40.9940	-71.1352	-95.6888	-111.1968	-120.9499	-114.6790	-104.5761	-81.8515	-56.5728	-34.0948	-883.3900 (H17)
Solar input (sum of months) = Sum (63)m =												-22.8250 (63)
Output from w/h	156.5378	122.0122	99.1662	55.7440	36.3089	9.5732	9.4654	33.3234	56.3347	100.5232	133.5645	157.6666 (64)
Total per year (kWh/year) = Sum (64)m =												970.2200 (64)
Heat gains from water heating, kWh/month	59.0560	51.8722	54.0508	47.8628	46.4761	40.9145	38.7122	43.2833	43.4602	49.6620	53.2542	57.4367 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844	152.2844 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.6557	46.7683	38.0345	28.7946	21.5243	18.1717	19.6352	25.5225	34.2563	43.4963	50.7665	54.1191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.3491	343.8809	334.9810	316.0341	292.1171	269.6384	254.6213	251.0896	259.9895	278.9364	302.8534	325.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665	52.7665 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229	-101.5229 (71)
Water heating gains (Table 5)	79.3763	77.1907	72.6489	66.4761	62.4678	56.8258	52.0325	58.1765	60.3614	66.7500	73.9641	77.1998 (72)
Total internal gains	578.9091	574.3679	552.1924	517.8328	482.6372	451.1639	432.8170	441.3166	461.1352	495.7106	534.1120	563.1790 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North	1.9200	13.4684	0.6300	0.7000	0.7700	7.9030 (74)
East	4.6500	25.1733	0.6300	0.7000	0.7700	35.7737 (76)
West	7.4000	25.1733	0.6300	0.7000	0.7700	56.9302 (80)

Solar gains	100.6069	167.2773	280.6291	412.4406	477.9789	542.8970	495.9841	442.5490	342.0584	214.1549	124.9645	78.3748 (83)
Total gains	679.5160	741.6452	832.8215	930.2734	960.6160	994.0609	928.8011	883.8656	803.1936	709.8655	659.0766	641.5537 (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	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	40.7916	
alpha	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	3.7194	
util living area	0.9628	0.9485	0.9056	0.8087	0.6576	0.4476	0.3168	0.3226	0.5813	0.8331	0.9371	0.9680 (86)
MIT	19.8183	19.9557	20.2700	20.6302	20.8714	20.9768	20.9953	20.9951	20.9397	20.6611	20.1950	19.7792 (87)
Th 2	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260	20.0260 (88)
util rest of house	0.9551	0.9380	0.8866	0.7721	0.5968	0.3677	0.2248	0.2261	0.4959	0.7903	0.9219	0.9612 (89)
MIT 2	18.9773	19.1107	19.4121	19.7428	19.9446	20.0163	20.0250	20.0250	19.9966	19.7796	19.3463	18.9397 (90)
Living area fraction									fLA = Living area / (4) =			0.2153 (91)
MIT	19.1583	19.2926	19.5968	19.9338	20.1441	20.2231	20.2339	20.2339	20.1996	19.9693	19.5290	19.1204 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1583	19.2926	19.5968	19.9338	20.1441	20.2231	20.2339	20.2339	20.1996	19.9693	19.5290	19.1204 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9465	0.9284	0.8769	0.7683	0.6046	0.3842	0.2447	0.2469	0.5119	0.7874	0.9125	0.9531	(94)
Useful gains	643.1507	688.5483	730.3091	714.7081	580.7518	381.9638	227.2485	218.2502	411.1631	558.9718	601.3820	611.4899	(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	1220.9509	1197.0219	1080.3293	885.5507	634.3370	389.2987	228.1793	219.1731	432.2106	708.6478	984.1778	1208.5277	(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	429.8834	341.6943	260.4151	123.0067	39.8674	0.0000	0.0000	0.0000	0.0000	111.3590	275.6130	444.1961	(98)
Space heating												2026.0349	(98)
Space heating per m2											(98) / (4) =	24.0565	(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													2233.7761	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	429.8834	341.6943	260.4151	123.0067	39.8674	0.0000	0.0000	0.0000	0.0000	111.3590	275.6130	444.1961	(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)	473.9618	376.7302	287.1170	135.6193	43.9552	0.0000	0.0000	0.0000	0.0000	122.7772	303.8732	489.7422	(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	156.5378	122.0122	99.1662	55.7440	36.3089	9.5732	9.4654	33.3234	56.3347	100.5232	133.5645	157.6666	(64)	
Efficiency of water heater	89.6819	89.6963	89.6485	89.5128	88.8979	87.0000	87.0000	87.0000	87.0000	88.9061	89.4581	89.7006	(216)	
Fuel for water heating, kWh/month	174.5478	136.0282	110.6166	62.2749	40.8433	11.0037	10.8797	38.3028	64.7525	113.0666	149.3040	175.7698	(219)	
Water heating fuel used												1087.3899	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2233.7761	(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)													109.1804	(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													234.1804	(231)
Electricity for lighting (calculated in Appendix L)													371.9662	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.64 * 1030 * 1.00) =										-527.3904		-527.3904	(233)	
Total delivered energy for all uses												3399.9222	(238)	

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

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	2233.7761	3.6300	81.0861 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1087.3899	3.6300	39.4723 (247)
Mechanical ventilation fans	109.1804	19.4400	21.2247 (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	371.9662	19.4400	72.3102 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-527.3904	19.4400	-102.5247 (252)
Total energy cost			230.8685 (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	2233.7761	0.2160	482.4956	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1087.3899	0.2160	234.8762	(264)
Space and water heating			717.3719	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Pumps and fans	234.1804	0.5190	121.5397 (267)
Energy for lighting	371.9662	0.5190	193.0504 (268)
Energy saving/generation technologies			
PV Unit	-527.3904	0.5190	-273.7156 (269)
Total kg/year			758.2463 (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	2233.7761	1.2200	2725.2068 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1087.3899	1.2200	1326.6157 (264)
Space and water heating			4051.8225 (265)
Pumps and fans	234.1804	3.0700	718.9340 (267)
Energy for lighting	371.9662	3.0700	1141.9362 (268)
Energy saving/generation technologies			
PV Unit	-527.3904	3.0700	-1619.0885 (269)
Primary energy kWh/year			4293.6041 (272)
Primary energy kWh/m2/year			50.9808 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 84	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	H (H/A - A/R)
Project	3 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.95	TER	18.46
Environmental	88 B	% DER<TER	19.00		
CO ₂ Emissions (t/year)	0.95	DFEE	44.58	TFEE	53.66
General Requirements Compliance	Pass	% DFEE<TFEE	16.92		

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 84	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	H (H/A - A/R)
Project	3 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.95	TER	18.46
Environmental	88 B	% DER<TER	19.00		
CO ₂ Emissions (t/year)	0.95	DFEE	44.58	TFEE	53.66
General Requirements Compliance	Pass	% DFEE<TFEE	16.92		

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

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 84	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	H (H/A - A/R)
Project	3 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.95	TER	18.46
Environmental	88 B	% DER<TER	19.00		
CO ₂ Emissions (t/year)	0.95	DFEE	44.58	TFEE	53.66
General Requirements Compliance	Pass	% DFEE<TFEE	16.92		

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 84	Issued on Date	30/03/2022
Assessment Reference	As Built	Prop Type Ref	H (H/A - A/R)
Property	3 Haines Crescent, West End, Southampton, SO30 3LG		
SAP Rating	86 B	DER	14.95
Environmental	88 B	TER	18.46
CO ₂ Emissions (t/year)	0.95	% DER<TER	19.00
General Requirements Compliance	Pass	DfEE	44.58
		TFEE	53.66
		% DfEE<TFEE	16.92
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, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	18.37 m	42.11 m ²	2.39 m
	1st Storey:	18.37 m	42.11 m ²	2.67 m

7.0 Living Area	18.13	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	157.02	kJ/m ² K

9.0 External Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
Brick and Block	Cavity Wall	Other		0.24	42.22	92.95	76.86

9.1 Party Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction				
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill		0.00	70.00	44.34

9.2 Internal Walls				Kappa (kJ/m ² K)	Area (m ²)
Description	Construction				
GF Stud	Plasterboard on timber frame			9.00	73.27
First Floor	Plasterboard on timber frame			9.00	86.60

10.0 External Roofs				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
Pitched Roof	External Plane Roof	Other		0.10	9.10	42.11	42.11

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.11

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	42.11

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.11

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					4.14	
Front Elevation	Window	[1] Brick and Block	East	None	0.51	Yes				0.51	
Side Elevation	Window	[1] Brick and Block	North	None	0.00					1.92	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					7.40	

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)	12.04	0.053	No	CD0025
Independently assessed	E3 Sill	9.52	0.034	No	CD0027
Independently assessed	E4 Jamb	28.50	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	18.38	0.060	No	CBA -302
Independently assessed	E6 Intermediate floor within a dwelling	18.38	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.70	0.060	No	CD0033
Independently assessed	E12 Gable (insulation at ceiling level)	8.78	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	10.10	0.050	No	CD0035
Table K1 - Approved	E18 Party wall between dwellings	10.10	0.060	No	CD0016
Table K1 - Default	P1 Party wall - Ground floor	8.78	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.78	0.000	No	
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	8.78	0.240	No	

Y-value	0.050	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.07	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	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	13	
Total number of L.E.L. fittings	13	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17503	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.7	
Controls	87.0	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
Fan Assisted Flue	Balanced	
	Yes	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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
25.0 Main Heating 2	None

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

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.64	West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£27	B 87	