



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 36 Shaw Road, West End
Southampton, SO30 3JZ

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 16/03/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 87	Issued on Date	16/03/2022
Assessment Reference	As Built	Prop Type Ref	S
Property	36 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	86 B	DER	14.98
Environmental	88 B	TER	19.24
CO ₂ Emissions (t/year)	0.93	% DER<TER	22.13
General Requirements Compliance	Pass	DfEE	47.88
		TfEE	58.27
		% DfEE<TfEE	17.84
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)	19.24	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.98	kgCO ₂ /m ²	Pass
	-4.26 (-22.1%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	58.27	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	47.88	kWh/m ² /yr	
	-10.4 (-17.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.12 (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 36CDi 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

0.31

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

4.43 m², No overhang

Windows facing East

5.40 m², No overhang

Windows facing South

6.94 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.12 (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
Thermal bridging ψ -value	0.027	W/m ² K
Photovoltaic array	0.65	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Assessment Reference	As Built	Prop Type Ref	S
Property	36 Shaw Road, West End, Southampton, SO30 3JZ		

SAP Rating	86 B	DER	14.98	TER	19.24
Environmental	88 B	% DER<TER	22.13		
CO ₂ Emissions (t/year)	0.93	DFEE	47.88	TFEE	58.27
General Requirements Compliance	Pass	% DFEE<TFEE	17.84		

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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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	1.92	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	11.44	0.49	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.060	1.51	0.09	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.034	12.35	0.42	CD0027
External wall	E4 Jamb	Independently assessed	0.039	30.30	1.18	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.037	27.54	1.02	Knauf P7
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	27.54	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	18.62	1.12	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.92	0.48	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	20.20	1.01	CD0035

Total: **5.91** W/mK:
Y-Value: **0.027** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS BUILT

Detached House, total floor area 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) 19.24 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.98 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)58.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)47.9 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.12 (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 36CDi 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: 0.31
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing North: 4.43 m², No overhang

Windows facing East: 5.40 m², No overhang

Windows facing South: 6.94 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Thermal bridging y-value 0.027 W/m²K

Photovoltaic array 0.65 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	41.8500 (1b)	x 2.3900 (2b)	= 100.0215 (1b) - (3b)
First floor	41.8500 (1c)	x 2.6700 (2c)	= 111.7395 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7610 (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					4.1200
Infiltration rate					0.2060 (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)	=	0.1906 (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	0.2430	0.2382	0.2334	0.2096	0.2048	0.1810	0.1810	0.1763	0.1906	0.2048	0.2144	0.2239 (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)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.8500	0.1200	5.0220	84.0000	3515.4000 (28a)
Brick and Block	139.3500	18.8900	120.4600	0.2400	28.9104	42.2200	5085.8212 (29a)
Pitched Roof	41.8500		41.8500	0.1000	4.1850	9.1000	380.8350 (30)
Total net area of external elements Aum(A, m ²)			223.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		59.6517		(33)
GF Stud			27.2800			9.0000	245.5200 (32c)
First Floor			98.3700			9.0000	885.3300 (32c)
GF Block			43.1200			75.0000	3234.0000 (32c)
Internal Floor 1			41.8500			18.0000	753.3000 (32d)
Internal Ceiling 1			41.8500			18.0000	753.3000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14853.5062 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							177.4612 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9137 (36)
Total fabric heat loss						(33) + (36) =	65.5654 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406 (38)
Average = Sum(39)m / 12 =	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008 (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												2.5293 (42)
Average daily hot water use (litres/day)												94.2715 (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 DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	103.6987	99.9278	96.1569	92.3861	88.6152	84.8444	84.8444	88.6152	92.3861	96.1569	99.9278	103.6987 (44)
Energy content (annual)	153.7821	134.4988	138.7907	121.0011	116.1035	100.1885	92.8393	106.5345	107.8069	125.6385	137.1443	148.9298 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0673	20.1748	20.8186	18.1502	17.4155	15.0283	13.9259	15.9802	16.1710	18.8458	20.5716	22.3395 (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	27.5590	24.8892	27.5298	26.6122	27.4778	26.5667	27.4368	27.4634	26.5915	27.5083	26.6552	27.5509 (61)
Total heat required for water heating calculated for each month	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (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	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (64)
Heat gains from water heating, kWh/month	58.0223	50.9432	53.0304	46.8859	45.4739	39.9543	37.7283	42.2886	42.4937	48.6519	52.2643	56.4069 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3759	18.0977	14.7181	11.1425	8.3292	7.0318	7.5981	9.8763	13.2560	16.8316	19.6449	20.9422 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.9994	229.3550	223.4191	210.7823	194.8306	179.8382	169.8224	167.4668	173.4027	186.0396	201.9913	216.9836 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466 (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)	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731 (71)
Water heating gains (Table 5)	77.9870	75.8083	71.2774	65.1194	61.1208	55.4921	50.7101	56.8395	59.0190	65.3923	72.5892	75.8157 (72)
Total internal gains	389.3022	387.2009	373.3544	350.9841	328.2204	306.3021	292.0705	298.1226	309.6176	332.2033	358.1653	377.6815 (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				4.4300	10.6334	0.6300	0.7000	0.7700		14.3962 (74)		
East				5.4000	19.6403	0.6300	0.7000	0.7700		32.4125 (76)		
South				6.9400	46.7521	0.6300	0.7000	0.7700		99.1590 (78)		

Solar gains	145.9677	253.3145	358.0344	461.1843	531.4294	533.8135	512.0847	458.9326	393.7477	283.1458	175.7114	124.3383 (83)
Total gains	535.2699	640.5154	731.3889	812.1684	859.6498	840.1156	804.1552	757.0552	703.3653	615.3492	533.8767	502.0198 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520
alpha	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368
util living area	0.9904	0.9808	0.9606	0.9138	0.8206	0.6735	0.5218	0.5690	0.7833	0.9382	0.9828	0.9924 (86)
MIT	19.3479	19.5758	19.9141	20.3181	20.6701	20.8886	20.9674	20.9546	20.7949	20.3267	19.7449	19.2875 (87)
Th 2	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194 (88)
util rest of house	0.9881	0.9762	0.9508	0.8913	0.7729	0.5879	0.4057	0.4523	0.7109	0.9173	0.9779	0.9906 (89)
MIT 2	18.4217	18.6471	18.9794	19.3674	19.6868	19.8608	19.9087	19.9031	19.7973	19.3839	18.8168	18.3617 (90)
Living area fraction	18.5904	18.8163	19.1497	19.5406	19.8659	20.0481	20.1016	20.0947	19.9790	19.5557	18.9859	18.5304 (92)
MIT	18.5904	18.8163	19.1497	19.5406	19.8659	20.0481	20.1016	20.0947	19.9790	19.5557	18.9859	18.5304 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	526.7919	621.2855	688.9441	716.2486	662.1332	503.2122	342.7250	357.6622	503.1985	559.0587	518.9883	495.6060 (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	1436.2755	1398.6732	1271.3686	1069.4472	820.7247	547.5645	351.9330	371.3410	590.8767	900.0991	1194.6021	1440.2914 (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	676.6558	522.4045	433.3238	254.3030	117.9921	0.0000	0.0000	0.0000	0.0000	253.7340	486.4420	702.8459 (98)
Space heating												3447.7011 (98)
Space heating per m2												41.1912 (99)

FULL SAP CALCULATION PRINTOUT

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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												3801.2140	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	676.6558	522.4045	433.3238	254.3030	117.9921	0.0000	0.0000	0.0000	0.0000	253.7340	486.4420	702.8459	(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)	746.0372	575.9697	477.7550	280.3782	130.0905	0.0000	0.0000	0.0000	0.0000	279.7508	536.3197	774.9128	(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	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807	(64)
Efficiency of water heater (217)m	90.0934	90.0296	89.9057	89.6511	89.1413	87.9000	87.9000	87.9000	87.9000	89.6254	89.9780	90.1238	(216)
Fuel for water heating, kWh/month	201.2812	177.0397	184.9945	164.6531	161.0715	144.2038	136.8330	152.4436	152.8992	170.8743	182.0439	195.8202	(219)
Water heating fuel used												2024.1580	(219)
Annual totals kWh/year													
Space heating fuel - main system												3801.2140	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4340)													
mechanical ventilation fans (SFP = 0.4340)												112.1232	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												187.1232	(231)
Electricity for lighting (calculated in Appendix L)												359.8453	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 + 0.65 * 1068 * 1.00) =										-555.3967		-555.3967	(233)
Total delivered energy for all uses												5816.9439	(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	3801.2140	0.2160	821.0622	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2024.1580	0.2160	437.2181	(264)
Space and water heating			1258.2803	(265)
Pumps and fans	187.1232	0.5190	97.1169	(267)
Energy for lighting	359.8453	0.5190	186.7597	(268)
Energy saving/generation technologies				
PV Unit	-555.3967	0.5190	-288.2509	(269)
Total CO2, kg/year			1253.9062	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.9800	(273)

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

DER	14.9800	ZC1
Total Floor Area	83.7000	
Assumed number of occupants	2.5293	
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	
CO2 emissions from appliances, equation (L14)	16.0711	ZC2
CO2 emissions from cooking, equation (L16)	2.1470	ZC3
Total CO2 emissions	33.1981	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	33.1981	ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.8500 (1b)	x 2.3900 (2b)	= 100.0215 (1b) - (3b)
First floor	41.8500 (1c)	x 2.6700 (2c)	= 111.7395 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7610 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1417 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3917 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3623 (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	0.4619	0.4529	0.4438	0.3985	0.3895	0.3442	0.3442	0.3351	0.3623	0.3895	0.4076	0.4257 (22b)
Effective ac	0.6067	0.6025	0.5985	0.5794	0.5758	0.5592	0.5592	0.5562	0.5656	0.5758	0.5831	0.5906 (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)			16.7700	1.3258	22.2330		(27)					
Ground Floor			41.8500	0.1300	5.4405		(28a)					
Brick and Block	139.3500	18.8900	120.4600	0.1800	21.6828		(29a)					
Pitched Roof	41.8500		41.8500	0.1300	5.4405		(30)					
Total net area of external elements Aum(A, m2)			223.0500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.9168		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7528 (36)					
Total fabric heat loss						(33) + (36) =	67.6696 (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	42.3960	42.1065	41.8227	40.4899	40.2405	39.0796	39.0796	38.8646	39.5268	40.2405	40.7450	41.2724 (38)
Heat transfer coeff	110.0655	109.7760	109.4923	108.1594	107.9100	106.7492	106.7492	106.5342	107.1963	107.9100	108.4145	108.9419 (39)
Average = Sum(39)m / 12 =												108.1582 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3150	1.3115	1.3082	1.2922	1.2892	1.2754	1.2754	1.2728	1.2807	1.2892	1.2953	1.3016 (40)
HLP (average)												1.2922 (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												2.5293 (42)
Average daily hot water use (litres/day)												94.2715 (43)
Daily hot water use	Jan 103.6987	Feb 99.9278	Mar 96.1569	Apr 92.3861	May 88.6152	Jun 84.8444	Jul 84.8444	Aug 88.6152	Sep 92.3861	Oct 96.1569	Nov 99.9278	Dec 103.6987 (44)
Energy conte	153.7821	134.4988	138.7907	121.0011	116.1035	100.1885	92.8393	106.5345	107.8069	125.6385	137.1443	148.9298 (45)
Energy content (annual)										Total = Sum(45)m =		1483.2580 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0673	20.1748	20.8186	18.1502	17.4155	15.0283	13.9259	15.9802	16.1710	18.8458	20.5716	22.3395 (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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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	45.9942	49.0005	45.5603	45.1573	41.8411	43.2358	45.1573	45.5603	49.0005	49.2795	50.9589 (61)
Solar input	204.7410	180.4930	187.7913	166.5614	161.2608	142.0295	136.0751	151.6918	153.3671	174.6390	186.4237	199.8887 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	204.7410	180.4930	187.7913	166.5614	161.2608	142.0295	136.0751	151.6918	153.3671	174.6390	186.4237	199.8887 (64)
	63.8723	56.2194	58.3981	51.6229	49.8937	43.7729	41.6780	46.7121	47.2358	54.0249	57.9203	62.2589 (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	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3759	18.0977	14.7181	11.1425	8.3292	7.0318	7.5981	9.8763	13.2560	16.8316	19.6449	20.9422	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.9994	229.3550	223.4191	210.7823	194.8306	179.8382	169.8224	167.4668	173.4027	186.0396	201.9913	216.9836	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	(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)	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	(71)
Water heating gains (Table 5)	85.8498	83.6598	78.4920	71.6985	67.0615	60.7957	56.0188	62.7850	65.6053	72.6142	80.4449	83.6813	(72)
Total internal gains	397.1651	395.0524	380.5691	357.5632	334.1611	311.6057	297.3793	304.0681	316.2040	339.4252	366.0210	385.5471	(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					4.4300	10.6334	0.6300	0.7000	0.7700		14.3962 (74)	
East					5.4000	19.6403	0.6300	0.7000	0.7700		32.4125 (76)	
South					6.9400	46.7521	0.6300	0.7000	0.7700		99.1590 (78)	
Solar gains	145.9677	253.3145	358.0344	461.1843	531.4294	533.8135	512.0847	458.9326	393.7477	283.1458	175.7114	124.3383 (83)
Total gains	543.1328	648.3669	738.6035	818.7476	865.5905	845.4192	809.4640	763.0007	709.9517	622.5710	541.7324	509.8854 (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	52.8094	52.9487	53.0859	53.7401	53.8643	54.4501	54.4501	54.5600	54.2229	53.8643	53.6137	53.3541	
alpha	4.5206	4.5299	4.5391	4.5827	4.5910	4.6300	4.6300	4.6373	4.6149	4.5910	4.5742	4.5569	
util living area	0.9971	0.9932	0.9832	0.9529	0.8761	0.7253	0.5597	0.6101	0.8383	0.9691	0.9940	0.9979	(86)
MIT	19.5877	19.7755	20.0605	20.4219	20.7316	20.9232	20.9817	20.9731	20.8416	20.4321	19.9413	19.5571	(87)
Th 2	19.8291	19.8318	19.8345	19.8469	19.8493	19.8602	19.8602	19.8622	19.8560	19.8493	19.8445	19.8396	(88)
util rest of house	0.9962	0.9909	0.9771	0.9348	0.8276	0.6269	0.4250	0.4747	0.7599	0.9536	0.9916	0.9971	(89)
MIT 2	17.9653	18.2406	18.6550	19.1763	19.5879	19.8096	19.8537	19.8515	19.7315	19.2011	18.4924	17.9279	(90)
Living area fraction	18.2609	18.5203	18.9111	19.4032	19.7963	20.0125	20.0592	20.0558	19.9338	19.4254	18.7564	18.2247	(91)
MIT	18.2609	18.5203	18.9111	19.4032	19.7963	20.0125	20.0592	20.0558	19.9338	19.4254	18.7564	18.2247	(92)
Temperature adjustment	18.2609	18.5203	18.9111	19.4032	19.7963	20.0125	20.0592	20.0558	19.9338	19.4254	18.7564	18.2247	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9941	0.9870	0.9703	0.9258	0.8249	0.6414	0.4496	0.4991	0.7661	0.9458	0.9880	0.9955	(94)
Ext temp.	539.9331	639.9447	716.6725	758.0124	714.0554	542.2103	363.9019	380.8453	543.9255	588.8094	535.2485	507.5935	(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	1536.6162	1495.1817	1358.9163	1136.0234	873.6735	577.7760	369.2711	389.4725	625.3576	952.3474	1263.7225	1527.8789	(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	741.5322	574.7193	477.8294	272.1679	118.7558	0.0000	0.0000	0.0000	0.0000	270.4723	524.5013	759.0923	(98)
Space heating per m2												3739.0706	(98)
												44.6723	(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												4003.2876 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	741.5322	574.7193	477.8294	272.1679	118.7558	0.0000	0.0000	0.0000	0.0000	270.4723	524.5013	759.0923 (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)	793.9317	615.3312	511.5947	291.4003	127.1476	0.0000	0.0000	0.0000	0.0000	289.5849	561.5646	812.7327 (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	204.7410	180.4930	187.7913	166.5614	161.2608	142.0295	136.0751	151.6918	153.3671	174.6390	186.4237	199.8887 (64)
Efficiency of water heater (217)m	88.0050	87.7618	87.3020	86.2800	84.2941	80.3000	80.3000	80.3000	80.3000	86.1486	87.5136	80.3000 (216)
Fuel for water heating, kWh/month	232.6470	205.6623	215.1053	193.0474	191.3073	176.8736	169.4584	188.9064	190.9927	202.7182	213.0226	88.0905 (217)
Water heating fuel used												226.9128 (219)
Annual totals kWh/year												2406.6541 (219)
Space heating fuel - main system												4003.2876 (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)												359.8453 (232)
Total delivered energy for all uses												6844.7871 (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	4003.2876	0.2160	864.7101 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2406.6541	0.2160	519.8373 (264)
Space and water heating			1384.5474 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	359.8453	0.5190	186.7597 (268)
Total CO2, kg/m2/year			1610.2321 (272)
Emissions per m2 for space and water heating			16.5418 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2313 (272b)
Emissions per m2 for pumps and fans			0.4651 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.5418 * 1.00) + 2.2313 + 0.4651, rounded to 2 d.p.			19.2400 (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	41.8500 (1b)	x 2.3900 (2b)	= 100.0215 (1b) - (3b)
First floor	41.8500 (1c)	x 2.6700 (2c)	= 111.7395 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7610 (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					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1417 (8)
Pressure test					Yes
Measured/design AP50					4.1200
Infiltration rate					0.3477 (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) =	0.3216 (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	0.4100	0.4020	0.3940	0.3538	0.3457	0.3055	0.3055	0.2975	0.3216	0.3457	0.3618	0.3779 (22b)
Effective ac	0.5841	0.5808	0.5776	0.5626	0.5598	0.5467	0.5467	0.5442	0.5517	0.5598	0.5654	0.5714 (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)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.8500	0.1200	5.0220	84.0000	3515.4000 (28a)
Brick and Block	139.3500	18.8900	120.4600	0.2400	28.9104	42.2200	5085.8212 (29a)
Pitched Roof	41.8500		41.8500	0.1000	4.1850	9.1000	380.8350 (30)
Total net area of external elements Aum(A, m ²)			223.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.6517		(33)
GF Stud			27.2800			9.0000	245.5200 (32c)
First Floor			98.3700			9.0000	885.3300 (32c)
GF Block			43.1200			75.0000	3234.0000 (32c)
Internal Floor 1			41.8500			18.0000	753.3000 (32d)
Internal Ceiling 1			41.8500			9.0000	376.6500 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14476.8562 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 172.9612 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9137 (36)
Total fabric heat loss (33) + (36) = 65.5654 (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	40.8150	40.5869	40.3633	39.3131	39.1166	38.2019	38.2019	38.0325	38.5542	39.1166	39.5141	39.9297 (38)
Heat transfer coeff	106.3804	106.1523	105.9287	104.8785	104.6820	103.7673	103.7673	103.5979	104.1196	104.6820	105.0795	105.4951 (39)
Average = Sum(39)m / 12 =												104.8776 (39)
HLP	1.2710	1.2682	1.2656	1.2530	1.2507	1.2398	1.2398	1.2377	1.2440	1.2507	1.2554	1.2604 (40)
HLP (average)												1.2530 (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												2.5293 (42)
Average daily hot water use (litres/day)												94.2715 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.6987	99.9278	96.1569	92.3861	88.6152	84.8444	84.8444	88.6152	92.3861	96.1569	99.9278	103.6987 (44)
Energy conte	153.7821	134.4988	138.7907	121.0011	116.1035	100.1885	92.8393	106.5345	107.8069	125.6395	137.1443	148.9298 (45)
Energy content (annual)										Total = Sum(45)m =		1483.2580 (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	32.6787	28.5810	29.4930	25.7127	24.6720	21.2900	19.7284	22.6386	22.9090	26.6982	29.1432	31.6476 (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	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3759	18.0977	14.7181	11.1425	8.3292	7.0318	7.5981	9.8763	13.2560	16.8316	19.6449	20.9422	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.9994	229.3550	223.4191	210.7823	194.8306	179.8382	169.8224	167.4668	173.4027	186.0396	201.9913	216.9836	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	(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)	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	(71)
Water heating gains (Table 5)	43.9230	42.5313	39.6412	35.7121	33.1613	29.5695	26.5166	30.4282	31.8180	35.8847	40.4766	42.5371	(72)
Total internal gains	352.2383	350.9239	338.7182	318.5768	297.2609	277.3795	264.8770	268.7113	279.4167	299.6957	323.0527	341.4028	(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				4.4300	10.6334		0.6300		0.7000		0.7700		14.3962 (74)
East				5.4000	19.6403		0.6300		0.7000		0.7700		32.4125 (76)
South				6.9400	46.7521		0.6300		0.7000		0.7700		99.1590 (78)
Solar gains	145.9677	253.3145	358.0344	461.1843	531.4294	533.8135	512.0847	458.9326	393.7477	283.1458	175.7114	124.3383	(83)
Total gains	498.2060	604.2384	696.7527	779.7612	828.6903	811.1930	776.9617	727.6439	673.1644	582.8415	498.7641	465.7412	(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	37.8016	37.8828	37.9628	38.3429	38.4149	38.7535	38.7535	38.8169	38.6224	38.4149	38.2696	38.1188	
alpha	3.5201	3.5255	3.5309	3.5562	3.5610	3.5836	3.5836	3.5878	3.5748	3.5610	3.5513	3.5413	
util living area	0.9918	0.9833	0.9655	0.9235	0.8389	0.6979	0.5481	0.5971	0.8061	0.9467	0.9854	0.9935	(86)
MIT	19.1514	19.3919	19.7541	20.2054	20.5968	20.8578	20.9554	20.9389	20.7450	20.2224	19.5980	19.1076	(87)
Th 2	19.8636	19.8658	19.8679	19.8778	19.8797	19.8883	19.8883	19.8899	19.8850	19.8797	19.8759	19.8720	(88)
util rest of house	0.9898	0.9792	0.9567	0.9028	0.7933	0.6118	0.4260	0.4757	0.7361	0.9281	0.9811	0.9919	(89)
MIT 2	18.1879	18.4278	18.7863	19.2303	19.5917	19.8121	19.8734	19.8675	19.7300	19.2562	18.6417	18.1505	(90)
Living area fraction	18.3634	18.6035	18.9626	19.4079	19.7748	20.0026	20.0706	20.0627	19.9149	19.4323	18.8159	18.3248	(91)
Temperature adjustment	18.3634	18.6035	18.9626	19.4079	19.7748	20.0026	20.0706	20.0627	19.9149	19.4323	18.8159	18.3248	(92)
adjusted MIT	18.3634	18.6035	18.9626	19.4079	19.7748	20.0026	20.0706	20.0627	19.9149	19.4323	18.8159	18.3248	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9860	0.9731	0.9477	0.8923	0.7884	0.6215	0.4472	0.4961	0.7383	0.9186	0.9756	0.9888	(94)
Ext temp.	491.2309	587.9777	660.2818	695.7537	653.3607	504.1589	347.4744	360.9579	496.9672	535.4003	486.5755	460.5051	(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	1496.0739	1454.6540	1320.1475	1102.0551	845.2905	560.6148	360.1310	379.4524	605.4500	924.5787	1231.1018	1490.1019	(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	747.6032	582.4065	490.9400	292.5370	142.7957	0.0000	0.0000	0.0000	0.0000	289.5488	536.0589	766.0200	(98)
Space heating per m2												3847.9101	(98)
												45.9726	(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	975.4127	767.8781	787.3442	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8072	0.8719	0.8471	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	787.3119	669.5150	666.9607	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1042.7940	1000.8106	944.7761	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	183.9471	246.4839	206.6947	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												637.1257 (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	45.9868	61.6210	51.6737	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												159.2814 (107)
Space cooling per m2												1.9030 (108)
Energy for space heating												45.9726 (99)
Energy for space cooling												1.9030 (108)
Total												47.8756 (109)
Dwelling Fabric Energy Efficiency (DFEE)												47.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.8500 (1b)	x 2.3900 (2b)	= 100.0215 (1b) - (3b)
First floor	41.8500 (1c)	x 2.6700 (2c)	= 111.7395 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7610 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1417 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3917 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3623 (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	0.4619	0.4529	0.4438	0.3985	0.3895	0.3442	0.3442	0.3351	0.3623	0.3895	0.4076	0.4257 (22b)
Effective ac	0.6067	0.6025	0.5985	0.5794	0.5758	0.5592	0.5592	0.5562	0.5656	0.5758	0.5831	0.5906 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			16.7700	1.3258	22.2330		(27)
Ground Floor			41.8500	0.1300	5.4405		(28a)
Brick and Block	139.3500	18.8900	120.4600	0.1800	21.6828		(29a)
Pitched Roof	41.8500		41.8500	0.1300	5.4405		(30)
Total net area of external elements Aum(A, m ²)			223.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.9168		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7528 (36)
Total fabric heat loss						(33) + (36) =	67.6696 (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	42.3960	42.1065	41.8227	40.4899	40.2405	39.0796	39.0796	38.8646	39.5268	40.2405	40.7450	41.2724 (38)
Average = Sum(39)m / 12 =	110.0655	109.7760	109.4923	108.1594	107.9100	106.7492	106.7492	106.5342	107.1963	107.9100	108.4145	108.9419 (39)
												108.1582 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3150	1.3115	1.3082	1.2922	1.2892	1.2754	1.2754	1.2728	1.2807	1.2892	1.2953	1.3016 (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												2.5293 (42)
Average daily hot water use (litres/day)												94.2715 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.6987	99.9278	96.1569	92.3861	88.6152	84.8444	84.8444	88.6152	92.3861	96.1569	99.9278	103.6987 (44)
Energy conte	153.7821	134.4988	138.7907	121.0011	116.1035	100.1885	92.8393	106.5345	107.8069	125.6385	137.1443	148.9298 (45)
Energy content (annual)										Total = Sum(45)m =		1483.2580 (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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Calculation Type: New Build (As Built)

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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)
	32.6787	28.5810	29.4930	25.7127	24.6720	21.2900	19.7284	22.6386	22.9090	26.6982	29.1432	31.6476 (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	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663	126.4663 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	20.3759	18.0977	14.7181	11.1425	8.3292	7.0318	7.5981	9.8763	13.2560	16.8316	19.6449	20.9422 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	226.9994	229.3550	223.4191	210.7823	194.8306	179.8382	169.8224	167.4668	173.4027	186.0396	201.9913	216.9836 (68)
Pumps, fans	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466	35.6466 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731 (71)
Total internal gains	43.9230	42.5313	39.6412	35.7121	33.1613	29.5695	26.5166	30.4282	31.8180	35.8847	40.4766	42.5371 (72)
	352.2383	350.9239	338.7182	318.5768	297.2609	277.3795	264.8770	268.7113	279.4167	299.6957	323.0527	341.4028 (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				4.4300	10.6334		0.6300		0.7000		0.7700	14.3962 (74)
East				5.4000	19.6403		0.6300		0.7000		0.7700	32.4125 (76)
South				6.9400	46.7521		0.6300		0.7000		0.7700	99.1590 (78)

Solar gains	145.9677	253.3145	358.0344	461.1843	531.4294	533.8135	512.0847	458.9326	393.7477	283.1458	175.7114	124.3383 (83)
Total gains	498.2060	604.2384	696.7527	779.7612	828.6903	811.1930	776.9617	727.6439	673.1644	582.8415	498.7641	465.7412 (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	52.8094	52.9487	53.0859	53.7401	53.8643	54.4501	54.4501	54.5600	54.2229	53.8643	53.6137	53.3541
util living area	4.5206	4.5299	4.5391	4.5827	4.5910	4.6300	4.6300	4.6373	4.6149	4.5910	4.5742	4.5569
	0.9980	0.9949	0.9865	0.9601	0.8899	0.7454	0.5798	0.6341	0.8583	0.9756	0.9957	0.9985 (86)
MIT	19.5394	19.7288	20.0181	20.3874	20.7088	20.9138	20.9789	20.9685	20.8226	20.3942	19.8956	19.5094 (87)
Th 2	19.8291	19.8318	19.8345	19.8469	19.8493	19.8602	19.8602	19.8622	19.8560	19.8493	19.8445	19.8396 (88)
util rest of house	0.9973	0.9931	0.9815	0.9442	0.8446	0.6478	0.4419	0.4960	0.7843	0.9630	0.9939	0.9980 (89)
MIT 2	18.5085	18.6992	18.9879	19.3572	19.6529	19.8207	19.8550	19.8535	19.7584	19.3712	18.8761	18.4867 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6963	18.8868	19.1756	19.5449	19.8453	20.0198	20.0598	20.0566	19.9523	19.5576	19.0618	18.6731 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6963	18.8868	19.1756	19.5449	19.8453	20.0198	20.0598	20.0566	19.9523	19.5576	19.0618	18.6731 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9963	0.9911	0.9777	0.9390	0.8444	0.6629	0.4673	0.5212	0.7918	0.9586	0.9922	0.9973 (94)
Ext temp.	496.3753	598.8454	681.2103	732.1662	699.7757	537.7797	363.0407	379.2664	532.9853	558.7323	494.8655	464.4730 (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	1584.5353	1535.4166	1387.8845	1151.3493	878.9565	578.5633	369.3286	389.5551	627.3443	966.6166	1296.8357	1576.7231 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	809.5911	629.3758	525.7656	301.8118	133.3105	0.0000	0.0000	0.0000	0.0000	303.4659	577.4185	827.5141 (98)
Space heating												4108.2533 (98)
Space heating per m2												(98) / (4) = 49.0831 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1003.4421	789.9438	809.6598	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8378	0.9043	0.8797	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	840.7048	714.3349	712.2424	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1042.7940	1000.8106	944.7761	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	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)
	0.0000	0.0000	0.0000	0.0000	0.0000	145.5042	213.1379	173.0051	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												531.6471 (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	36.3761	53.2845	43.2513	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												132.9118 (107)
Space cooling per m2												1.5880 (108)
Energy for space heating												49.0831 (99)
Energy for space cooling												1.5880 (108)
Total												50.6710 (109)
Target Fabric Energy Efficiency (TFEE)												58.3 (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	41.8500 (1b)	x 2.3900 (2b)	= 100.0215 (1b) - (3b)
First floor	41.8500 (1c)	x 2.6700 (2c)	= 111.7395 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7610 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1200
Infiltration rate					0.2060 (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) =		0.1906 (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	0.2239	0.2096	0.2096	0.1906	0.1953	0.1858	0.1858	0.1810	0.1810	0.1953	0.1906	0.1953 (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)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.8500	0.1200	5.0220	84.0000	3515.4000 (28a)
Brick and Block	139.3500	18.8900	120.4600	0.2400	28.9104	42.2200	5085.8212 (29a)
Pitched Roof	41.8500		41.8500	0.1000	4.1850	9.1000	380.8350 (30)
Total net area of external elements Aum(A, m ²)			223.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		59.6517		(33)
GF Stud			27.2800			9.0000	245.5200 (32c)
First Floor			98.3700			9.0000	885.3300 (32c)
GF Block			43.1200			75.0000	3234.0000 (32c)
Internal Floor 1			41.8500			18.0000	753.3000 (32d)
Internal Ceiling 1			41.8500			18.0000	753.3000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14853.5062 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							177.4612 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9137 (36)
Total fabric heat loss						(33) + (36) =	65.5654 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406 (38)
Average = Sum(39)m / 12 =	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008 (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												2.5293 (42)
Average daily hot water use (litres/day)												94.2715 (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	103.6987	99.9278	96.1569	92.3861	88.6152	84.8444	84.8444	88.6152	92.3861	96.1569	99.9278	103.6987 (44)
Energy content (annual)	153.7821	134.4988	138.7907	121.0011	116.1035	100.1885	92.8393	106.5345	107.8069	125.6385	137.1443	148.9298 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0673	20.1748	20.8186	18.1502	17.4155	15.0283	13.9259	15.9802	16.1710	18.8458	20.5716	22.3395 (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	27.5590	24.8892	27.5298	26.6122	27.4778	26.5667	27.4368	27.4634	26.5915	27.5083	26.6552	27.5509 (61)
Total heat required for water heating calculated for each month	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (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	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (64)
RHI water heating demand	58.0223	50.9432	53.0304	46.8859	45.4739	39.9543	37.7283	42.2886	42.4937	48.6519	52.2643	56.4069 (65)
Heat gains from water heating, kWh/month												
	58.0223	50.9432	53.0304	46.8859	45.4739	39.9543	37.7283	42.2886	42.4937	48.6519	52.2643	56.4069 (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	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.9398	45.2443	36.7951	27.8563	20.8229	17.5796	18.9953	24.6909	33.1400	42.0789	49.1123	52.3556 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	338.8051	342.3209	333.4613	314.6004	290.7919	268.4152	253.4663	249.9505	258.8101	277.6710	301.4795	323.8562 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053 (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)	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731 (71)
Water heating gains (Table 5)	77.9870	75.8083	71.2774	65.1194	61.1208	55.4921	50.7101	56.8395	59.0190	65.3923	72.5892	75.8157 (72)
Total internal gains	574.0238	569.6653	547.8257	513.8679	479.0274	447.7788	429.4635	437.7727	457.2609	491.4340	529.4729	558.3193 (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				4.4300	13.4684		0.6300	0.7000	0.7700		18.2344 (74)	
East				5.4000	25.1733		0.6300	0.7000	0.7700		41.5437 (76)	
South				6.9400	56.5862		0.6300	0.7000	0.7700		120.0168 (78)	
Solar gains	179.7949	265.8430	383.7488	499.0007	543.6964	605.5514	557.6363	519.4198	442.6838	320.9372	215.7698	144.9604 (83)
Total gains	753.8186	835.5083	931.5745	1012.8686	1022.7238	1053.3301	987.0998	957.1925	899.9447	812.3712	745.2426	703.2797 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520
alpha	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368
util living area	0.9639	0.9477	0.9058	0.8187	0.6798	0.4691	0.3322	0.3322	0.5799	0.8251	0.9355	0.9701 (86)
MIT	19.8185	19.9701	20.2764	20.6168	20.8580	20.9735	20.9946	20.9948	20.9411	20.6774	20.2100	19.7691 (87)
Th 2	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194 (88)
util rest of house	0.9554	0.9357	0.8845	0.7785	0.6119	0.3769	0.2253	0.2219	0.4845	0.7756	0.9179	0.9628 (89)
MIT 2	18.8849	19.0314	19.3234	19.6340	19.8336	19.9093	19.9184	19.9185	19.8932	19.6952	19.2668	18.8374 (90)
Living area fraction									fLA = Living area / (4) =			0.1822 (91)
MIT	19.0550	19.2024	19.4970	19.8130	20.0202	20.1032	20.1145	20.1146	20.0841	19.8742	19.4386	19.0072 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0550	19.2024	19.4970	19.8130	20.0202	20.1032	20.1145	20.1146	20.0841	19.8742	19.4386	19.0072 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9468	0.9260	0.8747	0.7741	0.6187	0.3930	0.2449	0.2421	0.4999	0.7733	0.9084	0.9549 (94)
Ext temp.	713.7352	773.6594	814.8158	784.0738	632.7341	414.0076	241.7021	231.7378	449.8720	628.1779	676.9515	671.5755 (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	1352.3122	1326.9234	1195.7216	976.2196	695.5249	422.4445	242.6705	232.6304	470.7827	781.3503	1089.3471	1337.4500 (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	475.1013	371.7935	283.3939	138.3449	46.7164	0.0000	0.0000	0.0000	0.0000	113.9603	296.9248	495.4106 (98)
RHI space heating demand												2221.6457 (98)
												2222 (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	41.8500 (1b)	x 2.3900 (2b)	= 100.0215 (1b) - (3b)
First floor	41.8500 (1c)	x 2.6700 (2c)	= 111.7395 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7610 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1200
Infiltration rate					0.2060 (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) =		0.1906 (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	0.2430	0.2382	0.2334	0.2096	0.2048	0.1810	0.1810	0.1763	0.1906	0.2048	0.2144	0.2239 (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)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.8500	0.1200	5.0220	84.0000	3515.4000 (28a)
Brick and Block	139.3500	18.8900	120.4600	0.2400	28.9104	42.2200	5085.8212 (29a)
Pitched Roof	41.8500		41.8500	0.1000	4.1850	9.1000	380.8350 (30)
Total net area of external elements Aum(A, m ²)			223.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		59.6517		(33)
GF Stud			27.2800			9.0000	245.5200 (32c)
First Floor			98.3700			9.0000	885.3300 (32c)
GF Block			43.1200			75.0000	3234.0000 (32c)
Internal Floor 1			41.8500			18.0000	753.3000 (32d)
Internal Ceiling 1			41.8500			18.0000	753.3000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14853.5062 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							177.4612 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9137 (36)
Total fabric heat loss						(33) + (36) =	65.5654 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406 (38)
Average = Sum(39)m / 12 =	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008 (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												2.5293 (42)
Average daily hot water use (litres/day)												94.2715 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	103.6987	99.9278	96.1569	92.3861	88.6152	84.8444	84.8444	88.6152	92.3861	96.1569	99.9278	103.6987 (44)
Energy content (annual)	153.7821	134.4988	138.7907	121.0011	116.1035	100.1885	92.8393	106.5345	107.8069	125.6385	137.1443	148.9298 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0673	20.1748	20.8186	18.1502	17.4155	15.0283	13.9259	15.9802	16.1710	18.8458	20.5716	22.3395 (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	27.5590	24.8892	27.5298	26.6122	27.4778	26.5667	27.4368	27.4634	26.5915	27.5083	26.6552	27.5509 (61)
Total heat required for water heating calculated for each month	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (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	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (64)
Heat gains from water heating, kWh/month	58.0223	50.9432	53.0304	46.8859	45.4739	39.9543	37.7283	42.2886	42.4937	48.6519	52.2643	56.4069 (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	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	50.9398	45.2443	36.7951	27.8563	20.8229	17.5796	18.9953	24.6909	33.1400	42.0789	49.1123	52.3556 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	338.8051	342.3209	333.4613	314.6004	290.7919	268.4152	253.4663	249.9505	258.8101	277.6710	301.4795	323.8562 (68)
Pumps, fans	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053 (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)	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731 (71)
Total internal gains	77.9870	75.8083	71.2774	65.1194	61.1208	55.4921	50.7101	56.8395	59.0190	65.3923	72.5892	75.8157 (72)
	574.0238	569.6653	547.8257	513.8679	479.0274	447.7788	429.4635	437.7727	457.2609	491.4340	529.4729	558.3193 (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				4.4300		10.6334	0.6300	0.7000	0.7700		14.3962 (74)	
East				5.4000		19.6403	0.6300	0.7000	0.7700		32.4125 (76)	
South				6.9400		46.7521	0.6300	0.7000	0.7700		99.1590 (78)	
Solar gains	145.9677	253.3145	358.0344	461.1843	531.4294	533.8135	512.0847	458.9326	393.7477	283.1458	175.7114	124.3383 (83)
Total gains	719.9915	822.9798	905.8601	975.0522	1010.4568	981.5923	941.5482	896.7053	851.0086	774.5798	705.1842	682.6576 (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	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520
util living area	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368
	0.9754	0.9591	0.9285	0.8662	0.7571	0.6015	0.4545	0.4936	0.7018	0.8886	0.9599	0.9795 (86)
MIT	19.5955	19.8075	20.1133	20.4654	20.7559	20.9240	20.9794	20.9717	20.8615	20.4863	19.9639	19.5327 (87)
Th 2	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194 (88)
util rest of house	0.9698	0.9500	0.9125	0.8360	0.7033	0.5175	0.3496	0.3870	0.6236	0.8566	0.9495	0.9748 (89)
MIT 2	18.6654	18.8724	19.1682	19.4987	19.7532	19.8810	19.9129	19.9097	19.8414	19.5264	19.0290	18.6037 (90)
Living area fraction	18.8349	19.0428	19.3404	19.6748	19.9359	20.0711	20.1072	20.1032	20.0272	19.7013	19.1993	18.7730 (92)
MIT												0.0000
Temperature adjustment	18.8349	19.0428	19.3404	19.6748	19.9359	20.0711	20.1072	20.1032	20.0272	19.7013	19.1993	18.7730 (93)
adjusted MIT												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9626	0.9409	0.9023	0.8282	0.7042	0.5300	0.3684	0.4058	0.6321	0.8490	0.9407	0.9683 (94)
Ext temp.	693.0937	774.3697	817.3624	807.5086	711.5397	520.2306	346.8315	363.9213	537.9139	657.6422	663.3505	661.0492 (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	1460.8403	1421.4341	1290.5351	1082.9358	827.7590	549.8752	352.4962	372.1943	595.7226	914.7363	1216.0545	1464.6739 (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	571.2034	434.8273	352.0405	198.3076	86.4672	0.0000	0.0000	0.0000	0.0000	191.2780	397.9469	597.8968 (98)
Space heating per m2												2829.9676 (98)
												(98) / (4) = 33.8108 (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	3120.1407 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	571.2034	434.8273	352.0405	198.3076	86.4672	0.0000	0.0000	0.0000	0.0000	191.2780	397.9469	597.8968 (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)	629.7722	479.4127	388.1373	218.6412	95.3331	0.0000	0.0000	0.0000	0.0000	210.8908	438.7507	659.2027 (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	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (64)
Efficiency of water heater (217)m	90.0091	89.9316	89.7824	89.4836	88.9319	87.9000	87.9000	87.9000	87.9000	89.4333	89.8653	87.9000 (216)
Fuel for water heating, kWh/month	201.4698	177.2325	185.2486	164.9613	161.4508	144.2038	136.8330	152.4436	152.8992	171.2414	182.2722	195.9888 (219)
Water heating fuel used	2026.2451 (219)											
Annual totals kWh/year												
Space heating fuel - main system	3120.1407 (211)											
Space heating fuel - secondary	0.0000 (215)											
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4340)												
mechanical ventilation fans (SFP = 0.4340)	112.1232 (230a)											
central heating pump	30.0000 (230c)											
main heating flue fan	45.0000 (230e)											
Total electricity for the above, kWh/year	187.1232 (231)											
Electricity for lighting (calculated in Appendix L)	359.8453 (232)											
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 + 0.65 + 1068 + 1.00) =	-555.3967											
Total delivered energy for all uses	5137.9577 (238)											

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3120.1407	3.4800	108.5809 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2026.2451	3.4800	70.5133 (247)
Mechanical ventilation fans	112.1232	13.1900	14.7891 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	359.8453	13.1900	47.4636 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-555.3967	13.1900	-73.2568 (252)
Total energy cost			297.9826 (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] =	0.9724 (257)
SAP value		86.4345
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	3120.1407	0.2160	673.9504 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2026.2451	0.2160	437.6689 (264)
Space and water heating			1111.6193 (265)
Pumps and fans	187.1232	0.5190	97.1169 (267)
Energy for lighting	359.8453	0.5190	186.7597 (268)
Energy saving/generation technologies			
PV Unit	-555.3967	0.5190	-288.2509 (269)
Total kg/year			1107.2452 (272)
CO2 emissions per m2			13.2300 (273)
EI value			88.4716
EI rating			88 (274)
EI band			B

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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	$3.48 / 0.8909 = 3.906$, stars = 4
Water heating environmental impact	$0.216 / 0.8909 = 0.2425$, 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	41.8500 (1b)	x 2.3900 (2b)	= 100.0215 (1b) - (3b)
First floor	41.8500 (1c)	x 2.6700 (2c)	= 111.7395 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7610 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1200
Infiltration rate					0.2060 (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)	=	0.1906 (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	0.2239	0.2096	0.2096	0.1906	0.1953	0.1858	0.1858	0.1810	0.1810	0.1953	0.1906	0.1953 (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)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.8500	0.1200	5.0220	84.0000	3515.4000 (28a)
Brick and Block	139.3500	18.8900	120.4600	0.2400	28.9104	42.2200	5085.8212 (29a)
Pitched Roof	41.8500		41.8500	0.1000	4.1850	9.1000	380.8350 (30)
Total net area of external elements Aum(A, m ²)			223.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		59.6517		(33)
GF Stud			27.2800			9.0000	245.5200 (32c)
First Floor			98.3700			9.0000	885.3300 (32c)
GF Block			43.1200			75.0000	3234.0000 (32c)
Internal Floor 1			41.8500			18.0000	753.3000 (32d)
Internal Ceiling 1			41.8500			18.0000	753.3000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14853.5062 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							177.4612 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9137 (36)
Total fabric heat loss						(33) + (36) =	65.5654 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406 (38)
Average = Sum(39)m / 12 =	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008 (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												2.5293 (42)
Average daily hot water use (litres/day)												94.2715 (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 09 Jan 2014

Energy conte	103.6987	99.9278	96.1569	92.3861	88.6152	84.8444	84.8444	88.6152	92.3861	96.1569	99.9278	103.6987 (44)
Energy content (annual)	153.7821	134.4988	138.7907	121.0011	116.1035	100.1885	92.8393	106.5345	107.8069	125.6385	137.1443	148.9298 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0673	20.1748	20.8186	18.1502	17.4155	15.0283	13.9259	15.9802	16.1710	18.8458	20.5716	22.3395 (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	27.5590	24.8892	27.5298	26.6122	27.4778	26.5667	27.4368	27.4634	26.5915	27.5083	26.6552	27.5509 (61)
Total heat required for water heating calculated for each month	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (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	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (64)
Heat gains from water heating, kWh/month	58.0223	50.9432	53.0304	46.8859	45.4739	39.9543	37.7283	42.2886	42.4937	48.6519	52.2643	56.4069 (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	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	50.9398	45.2443	36.7951	26.8563	20.8229	17.5796	18.9953	24.6909	33.1400	42.0789	49.1123	52.3556 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	338.8051	342.3209	333.4613	314.6004	290.7919	268.4152	253.4663	249.9505	258.8101	277.6710	301.4795	323.8562 (68)
Pumps, fans	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053 (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)	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731 (71)
Total internal gains	77.9870	75.8083	71.2774	65.1194	61.1208	55.4921	50.7101	56.8395	59.0190	65.3923	72.5892	75.8157 (72)
	574.0238	569.6653	547.8257	513.8679	479.0274	447.7788	429.4635	437.7727	457.2609	491.4340	529.4729	558.3193 (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				4.4300	13.4684		0.6300	0.7000	0.7700		18.2344 (74)	
East				5.4000	25.1733		0.6300	0.7000	0.7700		41.5437 (76)	
South				6.9400	56.5862		0.6300	0.7000	0.7700		120.0168 (78)	
Solar gains	179.7949	265.8430	383.7488	499.0007	543.6964	605.5514	557.6363	519.4198	442.6838	320.9372	215.7698	144.9604 (83)
Total gains	753.8186	835.5083	931.5745	1012.6686	1022.7238	1053.3301	987.0998	957.1925	899.9447	812.3712	745.2426	703.2797 (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	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520
util living area	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368
MIT	0.9639	0.9477	0.9058	0.8187	0.6798	0.4691	0.3322	0.3322	0.5799	0.8251	0.9355	0.9701 (86)
Th 2	19.8185	19.9701	20.2764	20.6168	20.8580	20.9735	20.9946	20.9948	20.9411	20.6774	20.2100	19.7691 (87)
util rest of house	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194 (88)
MIT 2	0.9554	0.9357	0.8845	0.7785	0.6119	0.3769	0.2253	0.2219	0.4845	0.7756	0.9179	0.9628 (89)
Living area fraction	18.8849	19.0314	19.3234	19.6340	19.8336	19.9093	19.9184	19.9185	19.8932	19.6952	19.2668	18.8374 (90)
MIT	19.0550	19.2024	19.4970	19.8130	20.0202	20.1032	20.1145	20.1146	fLA = Living area / (4) =	19.8742	19.4386	0.1822 (91)
Temperature adjustment	19.0550	19.2024	19.4970	19.8130	20.0202	20.1032	20.1145	20.1146	20.0841	19.8742	19.4386	19.0072 (92)
adjusted MIT	19.0550	19.2024	19.4970	19.8130	20.0202	20.1032	20.1145	20.1146	20.0841	19.8742	19.4386	19.0072 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9468	0.9260	0.8747	0.7741	0.6187	0.3930	0.2449	0.2421	0.4999	0.7733	0.9084	0.9549 (94)
Ext temp.	713.7352	773.6594	814.8158	784.0738	632.7341	414.0076	241.7021	231.7378	449.8720	628.1779	676.9515	671.5755 (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	1352.3122	1326.9234	1195.7216	976.2196	695.5249	422.4445	242.6705	232.6304	470.7827	781.3503	1089.3471	1337.4500 (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	475.1013	371.7935	283.3939	138.3449	46.7164	0.0000	0.0000	0.0000	0.0000	113.9603	296.9248	495.4106 (98)
Space heating per m2												2221.6457 (98)
										(98) / (4) =		26.5430 (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													2449.4440 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	475.1013	371.7935	283.3939	138.3449	46.7164	0.0000	0.0000	0.0000	0.0000	113.9603	296.9248	495.4106	(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)	523.8162	409.9156	312.4519	152.5302	51.5065	0.0000	0.0000	0.0000	0.0000	125.6453	327.3703	546.2080	(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	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807	(64)
Efficiency of water heater (217)m	89.9088	89.8413	89.6439	89.2327	88.5712	87.9000	87.9000	87.9000	87.9000	89.0732	89.6843	89.9474	(216)
Fuel for water heating, kWh/month	201.6944	177.4107	185.5347	165.4252	162.1083	144.2038	136.8330	152.4436	152.8992	171.9337	182.6400	196.2043	(219)
Water heating fuel used												2029.3309	(219)
Annual totals kWh/year													
Space heating fuel - main system												2449.4440	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4340)													
mechanical ventilation fans (SFP = 0.4340)												112.1232	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												187.1232	(231)
Electricity for lighting (calculated in Appendix L)												359.8453	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1184 * 1.00) =										-615.6368		-615.6368	(233)
Total delivered energy for all uses												4410.1067	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2449.4440	3.6300	88.9148 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2029.3309	3.6300	73.6647 (247)
Mechanical ventilation fans	112.1232	19.4400	21.7968 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	359.8453	19.4400	69.9539 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-615.6368	19.4400	-119.6798 (252)
Total energy cost			244.2304 (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	2449.4440	0.2160	529.0799 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2029.3309	0.2160	438.3355 (264)
Space and water heating			967.4154 (265)
Pumps and fans	187.1232	0.5190	97.1169 (267)
Energy for lighting	359.8453	0.5190	186.7597 (268)
Energy saving/generation technologies			
PV Unit	-615.6368	0.5190	-319.5155 (269)
Total kg/year			931.7766 (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	2449.4440	1.2200	2988.3217 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2029.3309	1.2200	2475.7837 (264)
Space and water heating			5464.1054 (265)
Pumps and fans	187.1232	3.0700	574.4683 (267)
Energy for lighting	359.8453	3.0700	1104.7252 (268)

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Energy saving/generation technologies			
PV Unit	-615.6368	3.0700	-1890.0050 (269)
Primary energy kWh/year			5253.2939 (272)
Primary energy kWh/m2/year			62.7634 (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	-190 kg (20.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£27 2.27 kg/m²	B 88	B 90
Total Savings	£27 2.27 kg/m²		

Potential energy efficiency rating:	B 88
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	£106	£116	-£10
Mains gas	£258	£221	£36
Space heating	£220	£220	£0
Water heating	£74	£47	£27
Lighting	£70	£70	£0
Generated (PV)	-£120	-£120	£0
Total cost of fuels	£244	£217	£26
Total cost of uses	£244	£217	£27
Delivered energy	53 kWh/m²	41 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	9 kg/m²	2 kg/m²
Primary energy	63 kWh/m²	50 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	41.8500 (1b)	x 2.3900 (2b)	= 100.0215 (1b) - (3b)
First floor	41.8500 (1c)	x 2.6700 (2c)	= 111.7395 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7610 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1200
Infiltration rate					0.2060 (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)	=	0.1906 (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	0.2430	0.2382	0.2334	0.2096	0.2048	0.1810	0.1810	0.1763	0.1906	0.2048	0.2144	0.2239 (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)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.8500	0.1200	5.0220	84.0000	3515.4000 (28a)
Brick and Block	139.3500	18.8900	120.4600	0.2400	28.9104	42.2200	5085.8212 (29a)
Pitched Roof	41.8500		41.8500	0.1000	4.1850	9.1000	380.8350 (30)
Total net area of external elements Aum(A, m ²)			223.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		59.6517		(33)
GF Stud			27.2800			9.0000	245.5200 (32c)
First Floor			98.3700			9.0000	885.3300 (32c)
GF Block			43.1200			75.0000	3234.0000 (32c)
Internal Floor 1			41.8500			18.0000	753.3000 (32d)
Internal Ceiling 1			41.8500			18.0000	753.3000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14853.5062 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							177.4612 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9137 (36)
Total fabric heat loss						(33) + (36) =	65.5654 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406	34.9406 (38)
Average = Sum(39)m / 12 =	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008	1.2008 (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												2.5293 (42)
Average daily hot water use (litres/day)												94.2715 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	103.6987	99.9278	96.1569	92.3861	88.6152	84.8444	84.8444	88.6152	92.3861	96.1569	99.9278	103.6987 (44)
Energy content (annual)	153.7821	134.4988	138.7907	121.0011	116.1035	100.1885	92.8393	106.5345	107.8069	125.6385	137.1443	148.9298 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0673	20.1748	20.8186	18.1502	17.4155	15.0283	13.9259	15.9802	16.1710	18.8458	20.5716	22.3395 (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	27.5590	24.8892	27.5298	26.6122	27.4778	26.5667	27.4368	27.4634	26.5915	27.5083	26.6552	27.5509 (61)
Total heat required for water heating calculated for each month	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (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												1.2227 (H8)
Utilisation factor												0.5586 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.2715 (H14)
Volume ratio Veff/V												0.7956 (H15)
Solar storage volume factor												0.9543 (H16)
Solar input												-850.0819 (H17)
Solar input	-24.6507	-41.1349	-70.0574	-93.8908	-115.9942	-114.0407	-112.5336	-98.3212	-77.0052	-52.5855	-29.2393	-20.6284 (63)
Solar input (sum of months) = Sum (63)m =												-850.0819 (63)
Output from w/h	156.6904	118.2531	96.2631	53.7226	27.5872	12.7144	7.7426	35.6767	57.3932	100.5613	134.5602	155.8523 (64)
Total per year (kWh/year) = Sum (64)m =												957.0171 (64)
Heat gains from water heating, kWh/month	58.0223	50.9432	53.0304	46.8859	45.4739	39.9543	37.7283	42.2886	42.4937	48.6519	52.2643	56.4069 (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	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.9398	45.2443	36.7951	27.8563	20.8229	17.5796	18.9953	24.6909	33.1400	42.0789	49.1123	52.3556 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	338.8051	342.3209	333.4613	314.6004	290.7919	268.4152	253.4663	249.9505	258.8101	277.6710	301.4795	323.8562 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053 (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)	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731 (71)
Water heating gains (Table 5)	77.9870	75.8083	71.2774	65.1194	61.1208	55.4921	50.7101	56.8395	59.0190	65.3923	72.5892	75.8157 (72)
Total internal gains	574.0238	569.6653	547.8257	513.8679	479.0274	447.7788	429.4635	437.7727	457.2609	491.4340	529.4729	558.3193 (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				4.4300	10.6334		0.6300		0.7000		0.7700		14.3962 (74)
East				5.4000	19.6403		0.6300		0.7000		0.7700		32.4125 (76)
South				6.9400	46.7521		0.6300		0.7000		0.7700		99.1590 (78)
Solar gains	145.9677	253.3145	358.0344	461.1843	531.4294	533.8135	512.0847	458.9326	393.7477	283.1458	175.7114	124.3383	(83)
Total gains	719.9915	822.9798	905.8601	975.0522	1010.4568	981.5923	941.5482	896.7053	851.0086	774.5798	705.1842	682.6576	(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)												
tau	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	
alpha	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	
util living area	0.9754	0.9591	0.9285	0.8662	0.7571	0.6015	0.4545	0.4936	0.7018	0.8886	0.9599	0.9795 (86)
MIT	19.5955	19.8075	20.1133	20.4654	20.7559	20.9240	20.9794	20.9717	20.8615	20.4863	19.9639	19.5327 (87)
Th 2	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194 (88)
util rest of house	0.9698	0.9500	0.9125	0.8360	0.7033	0.5175	0.3496	0.3870	0.6236	0.8566	0.9495	0.9748 (89)
MIT 2	18.6654	18.8724	19.1682	19.4987	19.7532	19.8810	19.9129	19.9097	19.8414	19.5264	19.0290	18.6037 (90)
Living area fraction									fLA = Living area / (4) =			0.1822 (91)
MIT	18.8349	19.0428	19.3404	19.6748	19.9359	20.0711	20.1072	20.1032	20.0272	19.7013	19.1993	18.7730 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8349	19.0428	19.3404	19.6748	19.9359	20.0711	20.1072	20.1032	20.0272	19.7013	19.1993	18.7730 (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	0.9626	0.9409	0.9023	0.8282	0.7042	0.5300	0.3684	0.4058	0.6321	0.8490	0.9407	0.9683	(94)
Useful gains	693.0937	774.3697	817.3624	807.5086	711.5397	520.2306	346.8315	363.9213	537.9139	657.6422	663.3505	661.0492	(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	1460.8403	1421.4341	1290.5351	1082.9358	827.7590	549.8752	352.4962	372.1943	595.7226	914.7363	1216.0545	1464.6739	(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	571.2034	434.8273	352.0405	198.3076	86.4672	0.0000	0.0000	0.0000	0.0000	191.2780	397.9469	597.8968	(98)
Space heating												2829.9676	(98)
Space heating per m2											(98) / (4) =	33.8108	(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													3120.1407 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	571.2034	434.8273	352.0405	198.3076	86.4672	0.0000	0.0000	0.0000	0.0000	191.2780	397.9469	597.8968	(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)	629.7722	479.4127	388.1373	218.6412	95.3331	0.0000	0.0000	0.0000	0.0000	210.8908	438.7507	659.2027	(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	156.6904	118.2531	96.2631	53.7226	27.5872	12.7144	7.7426	35.6767	57.3932	100.5613	134.5602	155.8523	(64)
Efficiency of water heater	90.0823	90.0864	90.0838	90.0883	90.0065	87.9000	87.9000	87.9000	87.9000	89.7153	89.9758	90.1065	(216)
Fuel for water heating, kWh/month	173.9414	131.2663	106.8595	59.6333	30.6502	14.4647	8.8084	40.5879	65.2937	112.0894	149.5516	172.9645	(219)
Water heating fuel used												1066.1108	(219)
Annual totals kWh/year													
Space heating fuel - main system												3120.1407	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4340)													
mechanical ventilation fans (SFP = 0.4340)													112.1232 (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													237.1232 (231)
Electricity for lighting (calculated in Appendix L)													359.8453 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1068 * 1.00) =										-555.3967		-555.3967	(233)
Total delivered energy for all uses												4227.8234	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3120.1407	3.4800	108.5809	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1066.1108	3.4800	37.1007	(247)
Mechanical ventilation fans	112.1232	13.1900	14.7891	(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	359.8453	13.1900	47.4636	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-555.3967	13.1900	-73.2568	(252)
Total energy cost			271.1649	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.8849 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	87.6554
SAP rating (Section 12)		88 (258)
SAP band		B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3120.1407	0.2160	673.9504 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1066.1108	0.2160	230.2799 (264)
Space and water heating			904.2303 (265)
Pumps and fans	237.1232	0.5190	123.0669 (267)
Energy for lighting	359.8453	0.5190	186.7597 (268)
Energy saving/generation technologies			
PV Unit	-555.3967	0.5190	-288.2509 (269)
Total kg/year			925.8061 (272)
CO2 emissions per m2			11.0600 (273)
EI value			90.3607
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	41.8500 (1b)	x 2.3900 (2b)	= 100.0215 (1b) - (3b)
First floor	41.8500 (1c)	x 2.6700 (2c)	= 111.7395 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.7610 (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												4.1200	
Infiltration rate												0.2060 (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) =			0.1906 (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)	
	0.2239	0.2096	0.2096	0.1906	0.1953	0.1858	0.1858	0.1810	0.1810	0.1953	0.1906	0.1953 (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)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.8500	0.1200	5.0220	84.0000	3515.4000 (28a)
Brick and Block	139.3500	18.8900	120.4600	0.2400	28.9104	42.2200	5085.8212 (29a)
Pitched Roof	41.8500		41.8500	0.1000	4.1850	9.1000	380.8350 (30)
Total net area of external elements Aum(A, m ²)			223.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		59.6517		(33)
GF Stud			27.2800			9.0000	245.5200 (32c)
First Floor			98.3700			9.0000	885.3300 (32c)
GF Block			43.1200			75.0000	3234.0000 (32c)
Internal Floor 1			41.8500			18.0000	753.3000 (32d)
Internal Ceiling 1			41.8500			18.0000	753.3000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14853.5062 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							177.4612 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9137 (36)
Total fabric heat loss						(33) + (36) =	65.5654 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan 34.9406	Feb 34.9406	Mar 34.9406	Apr 34.9406	May 34.9406	Jun 34.9406	Jul 34.9406	Aug 34.9406	Sep 34.9406	Oct 34.9406	Nov 34.9406	Dec 34.9406 (38)
Heat transfer coeff	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060	100.5060 (39)
Average = Sum(39)m / 12 =												100.5060 (39)
HLP	Jan 1.2008	Feb 1.2008	Mar 1.2008	Apr 1.2008	May 1.2008	Jun 1.2008	Jul 1.2008	Aug 1.2008	Sep 1.2008	Oct 1.2008	Nov 1.2008	Dec 1.2008 (40)
HLP (average)												1.2008 (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												2.5293 (42)
Average daily hot water use (litres/day)												94.2715 (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	103.6987	99.9278	96.1569	92.3861	88.6152	84.8444	84.8444	88.6152	92.3861	96.1569	99.9278	103.6987 (44)
Energy content (annual)	153.7821	134.4988	138.7907	121.0011	116.1035	100.1885	92.8393	106.5345	107.8069	125.6385	137.1443	148.9298 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1483.2580 (45)
	23.0673	20.1748	20.8186	18.1502	17.4155	15.0283	13.9259	15.9802	16.1710	18.8458	20.5716	22.3395 (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	27.5590	24.8892	27.5298	26.6122	27.4778	26.5667	27.4368	27.4634	26.5915	27.5083	26.6552	27.5509 (61)
Total heat required for water heating calculated for each month	181.3411	159.3880	166.3206	147.6134	143.5813	126.7552	120.2762	133.9979	134.3984	153.1468	163.7994	176.4807 (62)
Aperture area of solar collector												176.4807 (H1)
Zero-loss collector efficiency												3.0000 (H2)
Collector heat loss coefficient												0.7000 (H3)
Collector 2nd order heat loss coefficient												1.8000 (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												1.3660 (H8)
Utilisation factor												0.5191 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.2715 (H14)
Volume ratio Veff/V												0.7956 (H15)
Solar storage volume factor												0.9543 (H16)
Solar input												-882.4799 (H17)
Solar input	-28.7964	-40.9518	-71.0619	-95.5902	-111.0823	-120.8253	-114.5608	-104.4684	-81.7672	-56.5145	-34.0596	-22.8015 (63)
								Solar input (sum of months) =	Sum (63)m =			-882.4799 (63)
Output from w/h	152.5447	118.4363	95.2587	52.0231	32.4990	5.9299	5.7154	29.5296	52.6312	96.6323	129.7398	153.6792 (64)
								Total per year (kWh/year) =	Sum (64)m =			924.6191 (64)
Heat gains from water heating, kWh/month	58.0223	50.9432	53.0304	46.8859	45.4739	39.9543	37.7283	42.2886	42.4937	48.6519	52.2643	56.4069 (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	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596	151.7596 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.9398	45.2443	36.7951	27.8563	20.8229	17.5796	18.9953	24.6909	33.1400	42.0789	49.1123	52.3556 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	338.8051	342.3209	333.4613	314.6004	290.7919	268.4152	253.4663	249.9505	258.8101	277.6710	301.4795	323.8562 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053	52.7053 (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)	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731	-101.1731 (71)
Water heating gains (Table 5)	77.9870	75.8083	71.2774	65.1194	61.1208	55.4921	50.7101	56.8395	59.0190	65.3923	72.5892	75.8157 (72)
Total internal gains	574.0238	569.6653	547.8257	513.8679	479.0274	447.7788	429.4635	437.7727	457.2609	491.4340	529.4729	558.3193 (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	4.4300	13.4684	0.6300	0.7000	0.7700	18.2344 (74)
East	5.4000	25.1733	0.6300	0.7000	0.7700	41.5437 (76)
South	6.9400	56.5862	0.6300	0.7000	0.7700	120.0168 (78)

Solar gains	179.7949	265.8430	383.7488	499.0007	543.6964	605.5514	557.6363	519.4198	442.6838	320.9372	215.7698	144.9604 (83)
Total gains	753.8186	835.5083	931.5745	1012.8686	1022.7238	1053.3301	987.0998	957.1925	899.9447	812.3712	745.2426	703.2797 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520	41.0520
alpha	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368	3.7368
util living area	0.9639	0.9477	0.9058	0.8187	0.6798	0.4691	0.3322	0.3322	0.5799	0.8251	0.9355	0.9701 (86)
MIT	19.8185	19.9701	20.2764	20.6168	20.8580	20.9735	20.9946	20.9948	20.9411	20.6774	20.2100	19.7691 (87)
Th 2	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194	19.9194 (88)
util rest of house	0.9554	0.9357	0.8845	0.7785	0.6119	0.3769	0.2253	0.2219	0.4845	0.7756	0.9179	0.9628 (89)
MIT 2	18.8849	19.0314	19.3234	19.6340	19.8336	19.9093	19.9184	19.9185	19.8932	19.6952	19.2668	18.8374 (90)
Living area fraction									fLA = Living area / (4) =			0.1822 (91)
MIT	19.0550	19.2024	19.4970	19.8130	20.0202	20.1032	20.1145	20.1146	20.0841	19.8742	19.4386	19.0072 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0550	19.2024	19.4970	19.8130	20.0202	20.1032	20.1145	20.1146	20.0841	19.8742	19.4386	19.0072 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9468	0.9260	0.8747	0.7741	0.6187	0.3930	0.2449	0.2421	0.4999	0.7733	0.9084	0.9549	(94)
Useful gains	713.7352	773.6594	814.8158	784.0738	632.7341	414.0076	241.7021	231.7378	449.8720	628.1779	676.9515	671.5755	(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	1352.3122	1326.9234	1195.7216	976.2196	695.5249	422.4445	242.6705	232.6304	470.7827	781.3503	1089.3471	1337.4500	(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	475.1013	371.7935	283.3939	138.3449	46.7164	0.0000	0.0000	0.0000	0.0000	113.9603	296.9248	495.4106	(98)
Space heating												2221.6457	(98)
Space heating per m2											(98) / (4) =	26.5430	(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													2449.4440	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	475.1013	371.7935	283.3939	138.3449	46.7164	0.0000	0.0000	0.0000	0.0000	113.9603	296.9248	495.4106	(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)	523.8162	409.9156	312.4519	152.5302	51.5065	0.0000	0.0000	0.0000	0.0000	125.6453	327.3703	546.2080	(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	152.5447	118.4363	95.2587	52.0231	32.4990	5.9299	5.7154	29.5296	52.6312	96.6323	129.7398	153.6792	(64)	
Efficiency of water heater	90.0032	90.0073	89.9789	89.9173	89.5300	87.9000	87.9000	87.9000	87.9000	89.3934	89.8299	87.9000	(216)	
(217)m	90.0032	90.0073	89.9789	89.9173	89.5300	87.9000	87.9000	87.9000	87.9000	89.3934	89.8299	90.0211	(217)	
Fuel for water heating, kWh/month	169.4881	131.5851	105.8678	57.8567	36.2996	6.7461	6.5021	33.5945	59.8762	108.0978	144.4283	170.7147	(219)	
Water heating fuel used												1031.0571	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2449.4440	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4340)														
mechanical ventilation fans (SFP = 0.4340)													112.1232	(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													237.1232	(231)
Electricity for lighting (calculated in Appendix L)													359.8453	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.65 * 1184 * 1.00) =										-615.6368			-615.6368	(233)
Total delivered energy for all uses													3461.8329	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2449.4440	3.6300	88.9148	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1031.0571	3.6300	37.4274	(247)
Mechanical ventilation fans	112.1232	19.4400	21.7968	(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	359.8453	19.4400	69.9539	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-615.6368	19.4400	-119.6798	(252)
Total energy cost			217.7131	(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	2449.4440	0.2160	529.0799	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1031.0571	0.2160	222.7083	(264)
Space and water heating			751.7882	(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	237.1232	0.5190	123.0669 (267)
Energy for lighting	359.8453	0.5190	186.7597 (268)
Energy saving/generation technologies			
PV Unit	-615.6368	0.5190	-319.5155 (269)
Total kg/year			742.0994 (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	2449.4440	1.2200	2988.3217 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1031.0571	1.2200	1257.8897 (264)
Space and water heating			4246.2114 (265)
Pumps and fans	237.1232	3.0700	727.9683 (267)
Energy for lighting	359.8453	3.0700	1104.7252 (268)
Energy saving/generation technologies			
PV Unit	-615.6368	3.0700	-1890.0050 (269)
Primary energy kWh/year			4188.8999 (272)
Primary energy kWh/m2/year			50.0466 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 87	Issued on Date	16/03/2022
Assessment Reference	As Built	Prop Type Ref	S
Project	36 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.98	TER	19.24
Environmental	88 B	% DER<TER	22.13		
CO ₂ Emissions (t/year)	0.93	DFEE	47.88	TTEE	58.27
General Requirements Compliance	Pass	% DFEE<TTEE	17.84		

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 87	Issued on Date	16/03/2022
Assessment Reference	As Built	Prop Type Ref	S
Project	36 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.98	TER	19.24
Environmental	88 B	% DER<TER	22.13		
CO ₂ Emissions (t/year)	0.93	DFEE	47.88	TFEE	58.27
General Requirements Compliance	Pass	% DFEE<TFEE	17.84		

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 87	Issued on Date	16/03/2022
Assessment Reference	As Built	Prop Type Ref	S
Project	36 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.98	TER	19.24
Environmental	88 B	% DER<TER	22.13		
CO ₂ Emissions (t/year)	0.93	DFEE	47.88	TFEE	58.27
General Requirements Compliance	Pass	% DFEE<TFEE	17.84		

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

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 87	Issued on Date	16/03/2022
Assessment Reference	As Built	Prop Type Ref	S
Property	36 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	86 B	DER	14.98
Environmental	88 B	TER	19.24
CO ₂ Emissions (t/year)	0.93	% DER<TER	22.13
General Requirements Compliance	Pass	DfEE	47.88
		TFEE	58.27
		% DfEE<TFEE	17.84
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	South						
Property Tenure	Unknown						
Transaction Type	New dwelling						
Terrain Type	Suburban						
1.0 Property Type	House, Detached						
2.0 Number of Storeys	2						
3.0 Date Built	2020						
4.0 Sheltered Sides	1						
5.0 Sunlight/Shade	Average or unknown						
6.0 Measurements							
			Heat Loss Perimeter	Internal Floor Area	Average Storey Height		
		Ground Floor:	27.54 m	41.85 m²	2.39 m		
		1st Storey:	27.54 m	41.85 m²	2.67 m		
7.0 Living Area	15.25			m²			
8.0 Thermal Mass Parameter	Precise calculation						
Thermal Mass	177.46			kJ/m²K			
9.0 External Walls							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Brick and Block	Cavity Wall	Other		0.24	42.22	139.35	120.46
9.1 Party Walls							
Description	Type	Construction			U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
		Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill				70.00	
9.2 Internal Walls							
Description	Construction					Kappa (kJ/m²K)	Area (m²)
GF Stud	Plasterboard on timber frame					9.00	27.28
First Floor	Plasterboard on timber frame					9.00	98.37
GF Block	Dense block, plasterboard on dabs					75.00	43.12
10.0 External Roofs							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Other		0.10	9.10	41.85	41.85

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	41.85

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	41.85

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	41.85

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	Manufacture	Solid Door							1.10
Windows	Manufacture	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	South							2.12	
Front Elevation	Window	[1] Brick and Block	South	None	0.00					6.94	
Rear Elevation	Window	[1] Brick and Block	North	None	0.00					4.43	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					5.40	

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)	1.92	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	11.44	0.043	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.51	0.060	No	Birtley Supatherm
Independently assessed	E3 Sill	12.35	0.034	No	CD0027
Independently assessed	E4 Jamb	30.30	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	27.54	0.037	No	Knauf P7
Independently assessed	E6 Intermediate floor within a dwelling	27.54	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	18.62	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.92	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	20.20	0.050	No	CD0035

Y-value	0.027	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	Yes	
As Built AP ₅₀	4.12	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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	3
Manufacturer SFP	0.31
Duct Type	Rigid
Wet Rooms	3

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

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

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17515	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.7	
In Summer	87.9	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Combi boiler type	Standard Combi			
Combi keep hot type	Gas/Oil, time clock			
25.0 Main Heating 2				
None				
28.0 Water Heating				
Community Heating	None			
Water Heating	HWP From main heating 1			
Flue Gas Heat Recovery System	Main Heating 1			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder				
None				
32.0 Photovoltaic Unit				
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.65	South	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£27	B 88	