



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 12 Shaw Road, West End
Southampton, SO30 3JZ

Contact: Tobias Whiting
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Report Issue Date: 28/02/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 68	Issued on Date	28/02/2022
Assessment Reference	As Built	Prop Type Ref	G
Property	12 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	87 B	DER	14.19
Environmental	89 B	TER	18.15
CO ₂ Emissions (t/year)	1.00	% DER<TER	21.83
General Requirements Compliance	Pass	DfEE	44.89
		TfEE	55.29
		% DfEE<TfEE	18.82
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TfEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.15	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.19	kgCO ₂ /m ²	Pass
	-3.96 (-21.8%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	55.29	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	44.89	kWh/m ² /yr	
	-10.4 (-18.8%)	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	3.68 (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

Not applicable

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

4.32 m², No overhang

Windows facing East

0.66 m², No overhang

Windows facing South

7.49 m², No overhang

Windows facing West

1.76 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

3.68 (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	0.024	W/m ² K
Air permeability	3.7	m ³ /m ² h
Photovoltaic array	0.73	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Assessment Reference	As Built	Prop Type Ref	G
Property	12 Shaw Road, West End, Southampton, SO30 3JZ		

SAP Rating	87 B	DER	14.19	TER	18.15
Environmental	89 B	% DER<TER	21.83		
CO ₂ Emissions (t/year)	1.00	DFEE	44.89	TFEE	55.29
General Requirements Compliance	Pass	% DFEE<TFEE	18.82		

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	0.098	1.26	0.12	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	1.93	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	7.20	0.31	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	9.38	0.32	CD0027
External wall	E4 Jamb	Independently assessed	0.039	29.40	1.15	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.037	28.20	1.04	Knauf P7
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	28.20	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	12.14	0.73	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	16.06	0.87	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	20.20	1.01	CD0035

Total: **5.74** W/mK:
Y-Value: **0.024** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	1.00	DFEE	44.89	TFEE	55.29
General Requirements Compliance	Pass	% DFEE<TFEE	18.82		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com			Assessor ID	E477-0001
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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 98 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.15 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.19 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.9 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: 3.68 (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

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading: Average
Windows facing North: 4.32 m², No overhang
Windows facing East: 0.66 m², No overhang
Windows facing South: 7.49 m², No overhang
Windows facing West: 1.76 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 0.024 W/m²K
Air permeability 3.7 m³/m²h
Photovoltaic array 0.73 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.9400 (1b)	x 2.3900 (2b)	= 116.9666 (1b) - (3b)
First floor	48.9400 (1c)	x 2.6700 (2c)	= 130.6698 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.6364 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1615 (8)
Pressure test					Yes
Measured/design AP50					3.6800
Infiltration rate					0.3455 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3455 (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	0.4405	0.4319	0.4233	0.3801	0.3714	0.3283	0.3283	0.3196	0.3455	0.3714	0.3887	0.4060 (22b)
Effective ac	0.5970	0.5933	0.5896	0.5722	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5756	0.5824 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.2300	1.1450	16.2939		(27)
Ground Floor			48.9400	0.1200	5.8728	84.0000	4110.9600 (28a)
Brick and Block	142.6900	16.3500	126.3400	0.2400	30.3216	42.2200	5334.0748 (29a)
Pitched Roof	48.9400		48.9400	0.1000	4.8940	9.1000	445.3540 (30)
Total net area of external elements Aum(A, m ²)			240.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7143		(33)
GF Stud			32.0000			9.0000	288.0000 (32c)
First Floor			118.2700			9.0000	1064.4300 (32c)
GF Block			50.0400			75.0000	3753.0000 (32c)
Internal Floor 1			48.9400			18.0000	880.9200 (32d)
Internal Ceiling 1			48.9400			18.0000	880.9200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16757.6588 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 171.2062 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.7405 (36)
Total fabric heat loss (33) + (36) = 65.4548 (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	48.7902	48.4822	48.1804	46.7627	46.4974	45.2626	45.2626	45.0339	45.7382	46.4974	47.0340	47.5950 (38)
Heat transfer coeff	114.2450	113.9371	113.6352	112.2175	111.9522	110.7174	110.7174	110.4888	111.1931	111.9522	112.4888	113.0498 (39)
Average = Sum(39)m / 12 =												112.2162 (39)
HLP	1.1672	1.1640	1.1610	1.1465	1.1438	1.1312	1.1312	1.1288	1.1360	1.1438	1.1493	1.1550 (40)
HLP (average)												1.1465 (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												2.7190 (42)
Average daily hot water use (litres/day)												98.7766 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.6543	104.7032	100.7521	96.8011	92.8500	88.8989	88.8989	92.8500	96.8011	100.7521	104.7032	108.6543 (44)
Energy conte	161.1311	140.9263	145.4233	126.7836	121.6519	104.9763	97.2760	111.6256	112.9588	131.6426	143.6982	156.0469 (45)
Energy content (annual)										Total = Sum(45)m =		1554.1405 (45)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	24.1697	21.1389	21.8135	19.0175	18.2478	15.7464	14.5914	16.7438	16.9438	19.7464	21.5547	23.4070 (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	27.5632	24.8939	27.5494	26.6308	27.4950	26.5808	27.4500	27.4791	26.6081	27.5260	26.6600	27.5550 (61)
Total heat required for water heating calculated for each month	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019 (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	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019 (64)
Heat gains from water heating, kWh/month	60.4669	53.0815	55.2406	48.8132	47.3230	41.5498	39.2068	43.9853	44.2108	50.6527	54.4446	58.7743 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1878.1319 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.9875	21.3055	17.3268	13.1175	9.8055	8.2782	8.9449	11.6269	15.6056	19.8149	23.1269	24.6542 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.8542	255.4781	248.8661	234.7899	217.0214	200.3214	189.1648	186.5410	193.1530	207.2291	224.9977	241.6976 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951 (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)	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606 (71)
Water heating gains (Table 5)	81.2727	78.9903	74.2481	67.7962	63.6062	57.7081	52.6972	59.1200	61.4039	68.0815	75.6176	78.9978 (72)
Total internal gains	424.8997	422.5591	407.2262	382.4888	357.2182	333.0929	317.5922	324.0731	336.9477	361.9107	390.5274	412.1348 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	4.3200	10.6334	0.6300	0.7000	0.7700	14.0387 (74)
East	0.6600	19.6403	0.6300	0.7000	0.7700	3.9615 (76)
South	7.4900	46.7521	0.6300	0.7000	0.7700	107.0174 (78)
West	1.7600	19.6403	0.6300	0.7000	0.7700	10.5641 (80)

Solar gains	135.5817	230.5108	315.6433	393.8068	445.2294	444.2710	427.3509	388.3485	342.4580	254.6949	162.2824	116.1214 (83)
Total gains	560.4814	653.0699	722.8695	776.2957	802.4477	777.3639	744.9431	712.4216	679.4057	616.6057	552.8098	528.2562 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	40.7449	40.8551	40.9636	41.4811	41.5794	42.0431	42.0431	42.1301	41.8633	41.5794	41.3810	41.1757
alpha	3.7163	3.7237	3.7309	3.7654	3.7720	3.8029	3.8029	3.8087	3.7909	3.7720	3.7587	3.7450
util living area	0.9925	0.9861	0.9735	0.9439	0.8793	0.7536	0.6022	0.6430	0.8364	0.9551	0.9869	0.9940 (86)
MIT	19.2800	19.4840	19.7969	20.2005	20.5706	20.8424	20.9505	20.9356	20.7449	20.2636	19.6988	19.2461 (87)
Th 2	19.9463	19.9489	19.9514	19.9631	19.9652	19.9755	19.9755	19.9774	19.9715	19.9652	19.9608	19.9562 (88)
util rest of house	0.9907	0.9828	0.9668	0.9284	0.8427	0.6757	0.4829	0.5270	0.7752	0.9396	0.9832	0.9926 (89)
MIT 2	18.3782	18.5826	18.8939	19.2970	19.6465	19.8857	19.9575	19.9519	19.8097	19.3649	18.8064	18.3519 (90)
Living area fraction									fLA = Living area / (4) =			0.2144 (91)
MIT	18.5716	18.7759	19.0875	19.4908	19.8446	20.0909	20.1704	20.1629	20.0103	19.5576	18.9978	18.5437 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5716	18.7759	19.0875	19.4908	19.8446	20.0909	20.1704	20.1629	20.0103	19.5576	18.9978	18.5437 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9875	0.9778	0.9596	0.9197	0.8377	0.6855	0.5072	0.5498	0.7779	0.9318	0.9785	0.9898 (94)
Ext temp.	553.4827	638.5991	693.6900	713.9445	672.2331	532.8613	377.8041	391.6877	528.5189	574.5523	540.9430	522.8906 (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	1630.4582	1580.9806	1430.3890	1188.4700	911.8114	607.9376	395.3082	415.7527	657.1820	1002.8227	1338.3715	1621.5495 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating	801.2697	633.2804	548.1040	341.6584	178.2462	0.0000	0.0000	0.0000	0.0000	318.6332	574.1485	817.4022 (98)
Space heating per m2												4212.7427 (98)
(98) / (4) = 43.0399 (99)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													4644.6998	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	801.2697	633.2804	548.1040	341.6584	178.2462	0.0000	0.0000	0.0000	0.0000	318.6332	574.1485	817.4022	(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)	883.4286	698.2144	604.3043	376.6906	196.5229	0.0000	0.0000	0.0000	0.0000	351.3045	633.0193	901.2152	(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	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019	(64)	
Efficiency of water heater (217)m	90.1526	90.1044	90.0122	89.8134	89.4026	87.9000	87.9000	87.9000	87.9000	89.7476	90.0437	90.1731	(217)	
Fuel for water heating, kWh/month	209.3055	184.0312	192.1658	170.8145	166.8260	149.6668	141.8953	158.2534	158.7791	177.3513	189.1950	203.6104	(219)	
Water heating fuel used												2101.8944	(219)	
Annual totals kWh/year														
Space heating fuel - main system													4644.6998	(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)													423.6271	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424			-630.4424	(233)
Total delivered energy for all uses													6614.7789	(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	4644.6998	0.2160	1003.2552	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2101.8944	0.2160	454.0092	(264)
Space and water heating			1457.2644	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	423.6271	0.5190	219.8624	(268)
Energy saving/generation technologies				
PV Unit	-630.4424	0.5190	-327.1996	(269)
Total CO2, kg/year			1388.8522	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.1900	(273)

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

DER			14.1900	ZC1
Total Floor Area		TFA	97.8800	
Assumed number of occupants		N	2.7190	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.3081	ZC2
CO2 emissions from cooking, equation (L16)			1.8825	ZC3
Total CO2 emissions			31.3806	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			31.3806	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.9400 (1b)	x 2.3900 (2b)	= 116.9666 (1b) - (3b)
First floor	48.9400 (1c)	x 2.6700 (2c)	= 130.6698 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.6364 (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) = 0.1211 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3711 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3711 (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	0.4732	0.4639	0.4547	0.4083	0.3990	0.3526	0.3526	0.3433	0.3711	0.3990	0.4175	0.4361 (22b)
Effective ac	0.6120	0.6076	0.6034	0.5833	0.5796	0.5622	0.5622	0.5589	0.5689	0.5796	0.5872	0.5951 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			14.2300	1.3258	18.8655		(27)					
Ground Floor			48.9400	0.1300	6.3622		(28a)					
Brick and Block	142.6900	16.3500	126.3400	0.1800	22.7412		(29a)					
Pitched Roof	48.9400		48.9400	0.1300	6.3622		(30)					
Total net area of external elements Aum(A, m2)			240.5700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.4511		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5560 (36)					
Total fabric heat loss						(33) + (36) =	67.0071 (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	50.0097	49.6544	49.3062	47.6704	47.3643	45.9397	45.9397	45.6758	46.4884	47.3643	47.9835	48.6307 (38)
Heat transfer coeff	117.0168	116.6615	116.3133	114.6775	114.3715	112.9468	112.9468	112.6830	113.4956	114.3715	114.9906	115.6379 (39)
Average = Sum(39)m / 12 =												114.6761 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1955	1.1919	1.1883	1.1716	1.1685	1.1539	1.1539	1.1512	1.1595	1.1685	1.1748	1.1814 (40)
HLP (average)												1.1716 (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												2.7190 (42)
Average daily hot water use (litres/day)												98.7766 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.6543	104.7032	100.7521	96.8011	92.8500	88.8989	88.8989	92.8500	96.8011	100.7521	104.7032	108.6543 (44)
Energy conte	161.1311	140.9263	145.4233	126.7836	121.6519	104.9763	97.2760	111.6256	112.9588	131.6426	143.6982	156.0469 (45)
Energy content (annual)										Total = Sum(45)m =		1554.1405 (45)
Distribution loss (46)m = 0.15 x (45)m												
24.1697	21.1389	21.8135	19.0175	18.2478	15.7464	14.5914	16.7438	16.9438	19.7464	21.5547	23.4070 (46)	
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
	50.9589	46.0274	50.9589	47.7375	47.3153	43.8406	45.3019	47.3153	47.7375	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
Solar input	212.0900	186.9537	196.3822	174.5211	168.9672	148.8169	142.5779	158.9410	160.6963	182.6015	193.0132	207.0058 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h								Solar input (sum of months) = Sum (63)m =				0.0000 (63)
	212.0900	186.9537	196.3822	174.5211	168.9672	148.8169	142.5779	158.9410	160.6963	182.6015	193.0132	207.0058 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) = Sum (64)m =				2132.5668 (64)
	66.3158	58.3648	61.0930	54.0899	52.2781	45.8648	43.6697	48.9444	49.4932	56.5109	60.1084	64.6253 (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	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	23.9875	21.3055	17.3268	13.1175	9.8055	8.2782	8.9449	11.6269	15.6056	19.8149	23.1269	24.6542 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	252.8542	255.4781	248.8661	234.7899	217.0214	200.3214	189.1648	186.5410	193.1530	207.2291	224.9977	241.6976 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951 (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)												
	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606 (71)
Water heating gains (Table 5)												
	89.1342	86.8525	82.1142	75.1249	70.2662	63.7011	58.6959	65.7854	68.7405	75.9555	83.4839	86.8620 (72)
Total internal gains												
	432.7611	430.4212	415.0923	389.8176	363.8783	339.0859	323.5908	330.7385	344.2843	369.7847	398.3937	419.9990 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W
North			4.3200		10.6334		0.6300		0.7000		0.7700		14.0387 (74)
East			0.6600		19.6403		0.6300		0.7000		0.7700		3.9615 (76)
South			7.4900		46.7521		0.6300		0.7000		0.7700		107.0174 (78)
West			1.7600		19.6403		0.6300		0.7000		0.7700		10.5641 (80)
Solar gains	135.5817	230.5108	315.6433	393.8068	445.2294	444.2710	427.3509	388.3485	342.4580	254.6949	162.2824	116.1214	(83)
Total gains	568.3429	660.9321	730.7356	783.6244	809.1077	783.3569	750.9418	719.0870	686.7423	624.4796	560.6761	536.1204	(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	58.0876	58.2645	58.4389	59.2725	59.4311	60.1807	60.1807	60.3217	59.8898	59.4311	59.1111	58.7802
alpha	4.8725	4.8843	4.8959	4.9515	4.9621	5.0120	5.0120	5.0214	4.9927	4.9621	4.9407	4.9187
util living area												
	0.9983	0.9960	0.9905	0.9734	0.9234	0.7985	0.6309	0.6757	0.8827	0.9802	0.9963	0.9987 (86)
MIT	19.6803	19.8383	20.0826	20.4028	20.6973	20.9066	20.9778	20.9688	20.8306	20.4479	20.0068	19.6574 (87)
Th 2	19.9236	19.9265	19.9294	19.9428	19.9453	19.9570	19.9570	19.9592	19.9525	19.9453	19.9402	19.9349 (88)
util rest of house												
	0.9977	0.9947	0.9869	0.9624	0.8891	0.7113	0.4966	0.5442	0.8189	0.9699	0.9948	0.9983 (89)
MIT 2	18.1658	18.3985	18.7559	19.2258	19.6320	19.8898	19.9483	19.9455	19.8097	19.2966	18.6549	18.1402 (90)
Living area fraction									fLA = Living area / (4) =			0.2144 (91)
MIT	18.4905	18.7072	19.0404	19.4782	19.8605	20.1079	20.1691	20.1650	20.0286	19.5435	18.9448	18.4656 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4905	18.7072	19.0404	19.4782	19.8605	20.1079	20.1691	20.1650	20.0286	19.5435	18.9448	18.4656 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9965	0.9924	0.9828	0.9561	0.8857	0.7255	0.5255	0.5721	0.8245	0.9645	0.9926	0.9973 (94)
Useful gains	566.3262	655.8802	718.1563	749.1959	716.6284	568.3017	394.6534	411.4183	566.2276	602.2899	556.5453	534.6810 (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												
	1660.5324	1610.7741	1458.6185	1213.0864	933.3257	622.0945	403.1157	424.2474	672.8674	1022.8785	1362.0405	1649.6399 (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												
	814.0894	641.6887	550.9038	334.0011	161.2228	0.0000	0.0000	0.0000	0.0000	312.9179	579.9565	829.5294 (98)
Space heating												4224.3098 (98)
Space heating per m2										(98) / (4) =		43.1580 (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													4522.8156 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	814.0894	641.6887	550.9038	334.0011	161.2228	0.0000	0.0000	0.0000	0.0000	312.9179	579.9565	829.5294	(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)	871.6161	687.0329	589.8328	357.6029	172.6154	0.0000	0.0000	0.0000	0.0000	335.0298	620.9385	888.1472	(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	212.0900	186.9537	196.3822	174.5211	168.9672	148.8169	142.5779	158.9410	160.6963	182.6015	193.0132	207.0058	(64)
Efficiency of water heater (217)m	88.1095	87.9055	87.5075	86.6592	84.9333	80.3000	80.3000	80.3000	80.3000	86.3956	87.6472	88.1849	(216)
Fuel for water heating, kWh/month	240.7118	212.6758	224.4175	201.3877	198.9410	185.3261	177.5565	197.9339	200.1199	211.3551	220.2160	234.7407	(219)
Water heating fuel used												2505.3822	(219)
Annual totals kWh/year													
Space heating fuel - main system												4522.8156	(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)												423.6271	(232)
Total delivered energy for all uses												7526.8248	(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	4522.8156	0.2160	976.9282 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2505.3822	0.2160	541.1625 (264)
Space and water heating			1518.0907 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	423.6271	0.5190	219.8624 (268)
Total CO2, kg/m2/year			1776.8782 (272)
Emissions per m2 for space and water heating			15.5097 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2462 (272b)
Emissions per m2 for pumps and fans			0.3977 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5097 * 1.00) + 2.2462 + 0.3977, rounded to 2 d.p.			18.1500 (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	48.9400 (1b)	x 2.3900 (2b)	= 116.9666 (1b) - (3b)
First floor	48.9400 (1c)	x 2.6700 (2c)	= 130.6698 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.6364 (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) = 0.1211 (8)
Pressure test					Yes
Measured/design AP50					3.6800
Infiltration rate					0.3051 (18)
Number of sides sheltered					0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3051 (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	0.3891	0.3814	0.3738	0.3357	0.3280	0.2899	0.2899	0.2823	0.3051	0.3280	0.3433	0.3585 (22b)
Effective ac	0.5757	0.5727	0.5699	0.5563	0.5538	0.5420	0.5420	0.5398	0.5466	0.5538	0.5589	0.5643 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.2300	1.1450	16.2939		(27)
Ground Floor			48.9400	0.1200	5.8728	84.0000	4110.9600 (28a)
Brick and Block	142.6900	16.3500	126.3400	0.2400	30.3216	42.2200	5334.0748 (29a)
Pitched Roof	48.9400		48.9400	0.1000	4.8940	9.1000	445.3540 (30)
Total net area of external elements Aum(A, m ²)			240.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7143		(33)
GF Stud			32.0000			9.0000	288.0000 (32c)
First Floor			118.2700			9.0000	1064.4300 (32c)
GF Block			50.0400			75.0000	3753.0000 (32c)
Internal Floor 1			48.9400			18.0000	880.9200 (32d)
Internal Ceiling 1			48.9400			9.0000	440.4600 (32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			16317.1988 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							166.7062 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7405 (36)
Total fabric heat loss						(33) + (36) =	65.4548 (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	47.0449	46.8047	46.5693	45.4636	45.2567	44.2937	44.2937	44.1153	44.6646	45.2567	45.6752	46.1128 (38)
Average = Sum(39)m / 12 =	112.4997	112.2596	112.0241	110.9184	110.7115	109.7485	109.7485	109.5702	110.1195	110.7115	111.1301	111.5676 (39)
												110.9174 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1494	1.1469	1.1445	1.1332	1.1311	1.1213	1.1213	1.1194	1.1250	1.1311	1.1354	1.1398 (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												2.7190 (42)
Average daily hot water use (litres/day)												98.7766 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.6543	104.7032	100.7521	96.8011	92.8500	88.8989	88.8989	92.8500	96.8011	100.7521	104.7032	108.6543 (44)
Energy conte	161.1311	140.9263	145.4233	126.7836	121.6519	104.9763	97.2760	111.6256	112.9588	131.6426	143.6982	156.0469 (45)
Energy content (annual)										Total = Sum(45)m =		1554.1405 (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	34.2404	29.9468	30.9025	26.9415	25.8510	22.3075	20.6711	23.7204	24.0037	27.9740	30.5359	33.1600 (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	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.9875	21.3055	17.3268	13.1175	9.8055	8.2782	8.9449	11.6269	15.6056	19.8149	23.1269	24.6542	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.8542	255.4761	248.8661	234.7899	217.0214	200.3214	189.1648	186.5410	193.1530	207.2291	224.9977	241.6976	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	(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)	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	(71)
Water heating gains (Table 5)	46.0220	44.5638	41.5356	37.4188	34.7460	30.9826	27.7838	31.8823	33.3385	37.5995	42.4109	44.5698	(72)
Total internal gains	386.6489	385.1325	371.5136	349.1114	325.3581	303.3674	289.6787	293.8354	305.8823	328.4287	354.3207	374.7069	(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			4.3200		10.6334		0.6300		0.7000		0.7700		14.0387 (74)
East			0.6600		19.6403		0.6300		0.7000		0.7700		3.9615 (76)
South			7.4900		46.7521		0.6300		0.7000		0.7700		107.0174 (78)
West			1.7600		19.6403		0.6300		0.7000		0.7700		10.5641 (80)
Solar gains	135.5817	230.5108	315.6433	393.8068	445.2294	444.2710	427.3509	388.3485	342.4580	254.6949	162.2824	116.1214	(83)
Total gains	522.2307	615.6434	687.1569	742.9183	770.5875	747.6384	717.0297	682.1839	648.3403	583.1237	516.6031	490.8283	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.2895	40.3757	40.4605	40.8639	40.9402	41.2995	41.2995	41.3667	41.1603	40.9402	40.7860	40.6261	
alpha	3.6860	3.6917	3.6974	3.7243	3.7293	3.7533	3.7533	3.7578	3.7440	3.7293	3.7191	3.7084	
util living area	0.9935	0.9875	0.9756	0.9474	0.8856	0.7643	0.6146	0.6578	0.8469	0.9593	0.9886	0.9949	(86)
MIT	19.2283	19.4365	19.7557	20.1652	20.5456	20.8282	20.9446	20.9274	20.7237	20.2253	19.6482	19.1900	(87)
Th 2	19.9607	19.9627	19.9647	19.9738	19.9755	19.9835	19.9835	19.9850	19.9804	19.9755	19.9721	19.9684	(88)
util rest of house	0.9920	0.9846	0.9695	0.9330	0.8509	0.6885	0.4958	0.5427	0.7887	0.9454	0.9854	0.9936	(89)
MIT 2	18.3404	18.5486	18.8662	19.2738	19.6346	19.8837	19.9627	19.9554	19.8019	19.3386	18.7675	18.3080	(90)
Living area fraction									fLA = Living area / (4) =			0.2144	(91)
MIT	18.5308	18.7390	19.0569	19.4650	19.8299	20.0863	20.1733	20.1638	19.9996	19.5287	18.9564	18.4971	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5308	18.7390	19.0569	19.4650	19.8299	20.0863	20.1733	20.1638	19.9996	19.5287	18.9564	18.4971	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9891	0.9799	0.9625	0.9241	0.8451	0.6971	0.5196	0.5648	0.7900	0.9376	0.9811	0.9912	(94)
Ext temp.	516.5370	603.2901	661.4067	686.5651	651.2032	521.1806	372.6022	385.3258	512.1963	546.7197	506.8308	486.5157	(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	1600.9589	1553.5624	1406.6774	1171.8517	900.0790	602.1080	392.1637	412.4022	649.6623	988.5137	1317.5981	1595.0957	(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	806.8099	638.5830	554.4815	349.4064	185.1636	0.0000	0.0000	0.0000	0.0000	328.6948	583.7525	824.7835	(98)
Space heating per m2												4271.6752	(98)
												(98) / (4) =	43.6420 (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	1031.6359	812.1389	832.7332	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7682	0.8433	0.8200	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	792.4965	684.8580	682.8675	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	978.3564	940.3961	901.6962	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	133.8192	190.1203	162.8085	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												486.7480 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	33.4548	47.5301	40.7021	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												121.6870 (107)
Space cooling per m2												1.2432 (108)
Energy for space heating												43.6420 (99)
Energy for space cooling												1.2432 (108)
Total												44.8852 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.9 (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	48.9400 (1b)	x 2.3900 (2b)	= 116.9666 (1b) - (3b)
First floor	48.9400 (1c)	x 2.6700 (2c)	= 130.6698 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.6364 (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) = 0.1211 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3711 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3711 (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	0.4732	0.4639	0.4547	0.4083	0.3990	0.3526	0.3526	0.3433	0.3711	0.3990	0.4175	0.4361 (22b)
Effective ac	0.6120	0.6076	0.6034	0.5833	0.5796	0.5622	0.5622	0.5589	0.5689	0.5796	0.5872	0.5951 (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)			14.2300	1.3258	18.8655		(27)
Ground Floor			48.9400	0.1300	6.3622		(28a)
Brick and Block	142.6900	16.3500	126.3400	0.1800	22.7412		(29a)
Pitched Roof	48.9400		48.9400	0.1300	6.3622		(30)
Total net area of external elements Aum(A, m ²)			240.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.4511		(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)							10.5560 (36)
Total fabric heat loss						(33) + (36) =	67.0071 (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	50.0097	49.6544	49.3062	47.6704	47.3643	45.9397	45.9397	45.6758	46.4884	47.3643	47.9835	48.6307 (38)
Heat transfer coeff	117.0168	116.6615	116.3133	114.6775	114.3715	112.9468	112.9468	112.6830	113.4956	114.3715	114.9906	115.6379 (39)
Average = Sum(39)m / 12 =												114.6761 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1955	1.1919	1.1883	1.1716	1.1685	1.1539	1.1539	1.1512	1.1595	1.1685	1.1748	1.1814 (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												2.7190 (42)
Average daily hot water use (litres/day)												98.7766 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.6543	104.7032	100.7521	96.8011	92.8500	88.8989	88.8989	92.8500	96.8011	100.7521	104.7032	108.6543 (44)
Energy conte	161.1311	140.9263	145.4233	126.7836	121.6519	104.9763	97.2760	111.6256	112.9588	131.6426	143.6982	156.0469 (45)
Energy content (annual)										Total = Sum(45)m =		1554.1405 (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)
	34.2404	29.9468	30.9025	26.9415	25.8510	22.3075	20.6711	23.7204	24.0037	27.9740	30.5359	33.1600 (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	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507	135.9507 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.9875	21.3055	17.3268	13.1175	9.8055	8.2782	8.9449	11.6269	15.6056	19.8149	23.1269	24.6542 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.8542	255.4781	248.8661	234.7899	217.0214	200.3214	189.1648	186.5410	193.1530	207.2291	224.9977	241.6976 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951	36.5951 (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)	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606 (71)
Water heating gains (Table 5)	46.0220	44.5638	41.5356	37.4188	34.7460	30.9826	27.7838	31.8823	33.3385	37.5995	42.4109	44.5698 (72)
Total internal gains	386.6489	385.1325	371.5136	349.1114	325.3581	303.3674	289.6787	293.8354	305.8823	328.4287	354.3207	374.7069 (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			4.3200		10.6334		0.6300		0.7000		0.7700		14.0387 (74)
East			0.6600		19.6403		0.6300		0.7000		0.7700		3.9615 (76)
South			7.4900		46.7521		0.6300		0.7000		0.7700		107.0174 (78)
West			1.7600		19.6403		0.6300		0.7000		0.7700		10.5641 (80)
Solar gains	135.5817	230.5108	315.6433	393.8068	445.2294	444.2710	427.3509	388.3485	342.4580	254.6949	162.2824		116.1214 (83)
Total gains	522.2307	615.6434	687.1569	742.9183	770.5875	747.6384	717.0297	682.1839	648.3403	583.1237	516.6031		490.8283 (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	58.0876	58.2645	58.4389	59.2725	59.4311	60.1807	60.1807	60.3217	59.8898	59.4311	59.1111	58.7802
alpha	4.8725	4.8843	4.8959	4.9515	4.9621	5.0120	5.0120	5.0214	4.9927	4.9621	4.9407	4.9187
util living area	0.9988	0.9971	0.9927	0.9784	0.9348	0.8193	0.6550	0.7030	0.9011	0.9850	0.9974	0.9991 (86)
MIT	19.6367	19.7960	20.0429	20.3685	20.6717	20.8942	20.9738	20.9628	20.8095	20.4118	19.9655	19.6144 (87)
Th 2	19.9236	19.9265	19.9294	19.9428	19.9453	19.9570	19.9570	19.9592	19.9525	19.9453	19.9402	19.9349 (88)
util rest of house	0.9984	0.9961	0.9899	0.9692	0.9041	0.7350	0.5184	0.5704	0.8431	0.9769	0.9964	0.9988 (89)
MIT 2	18.6800	18.8412	19.0891	19.4207	19.7097	19.9038	19.9498	19.9477	19.8398	19.4679	19.0215	18.6667 (90)
Living area fraction									fLA = Living area / (4) =			0.2144 (91)
MIT	18.8852	19.0459	19.2937	19.6239	19.9160	20.1162	20.1694	20.1654	20.0478	19.6703	19.2239	18.8699 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8852	19.0459	19.2937	19.6239	19.9160	20.1162	20.1694	20.1654	20.0478	19.6703	19.2239	18.8699 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9978	0.9949	0.9876	0.9656	0.9031	0.7497	0.5481	0.5990	0.8495	0.9740	0.9953	0.9984 (94)
Ext temp.	521.0990	612.5081	678.6516	717.3986	695.8821	560.4987	392.9890	408.6213	550.7521	567.9899	514.1871	490.0455 (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	1706.7105	1650.2844	1488.0719	1229.7934	939.6777	623.0368	403.1562	424.2979	675.0438	1037.3882	1394.1402	1696.3997 (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	882.0950	697.3857	602.2087	368.9242	181.3839	0.0000	0.0000	0.0000	0.0000	349.2323	633.5663	897.5276 (98)
Space heating per m2										(98) / (4) =		47.1222 (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	1061.6998	835.8062	856.3904	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7978	0.8787	0.8547	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	847.0587	734.4248	731.9201	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	978.3564	940.3961	901.6962	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	94.5344	153.2426	126.3134	0.0000	0.0000	0.0000	0.0000 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												374.0904 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	23.6336	38.3107	31.5784	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												93.5226 (107)
Space cooling per m2												0.9555 (108)
Energy for space heating												47.1222 (99)
Energy for space cooling												0.9555 (108)
Total												48.0777 (109)
Target Fabric Energy Efficiency (TFEE)												55.3 (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	48.9400 (1b)	x 2.3900 (2b)	= 116.9666 (1b) - (3b)
First floor	48.9400 (1c)	x 2.6700 (2c)	= 130.6698 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.6364 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour										
										heating	heating													
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)							
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)							
Number of intermittent fans																4 * 10 =	40.0000 (7a)							
Number of passive vents																0 * 10 =	0.0000 (7b)							
Number of flueless gas fires																0 * 40 =	0.0000 (7c)							
										Air changes per hour														
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000	/ (5) =	0.1615 (8)							
Pressure test										Yes														
Measured/design AP50										3.6800														
Infiltration rate										0.3455 (18)														
Number of sides sheltered										0 (19)														
Shelter factor										(20) = 1 - [0.075 x (19)] =					1.0000 (20)									
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3455 (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													0.4060	0.3801	0.3801	0.3455	0.3542	0.3369	0.3369	0.3283	0.3283	0.3542	0.3455	0.3542 (22b)
Effective ac													0.5824	0.5722	0.5722	0.5597	0.5627	0.5567	0.5567	0.5539	0.5539	0.5627	0.5597	0.5627 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Front Door			2.1200	1.1000	2.3320			(26)					
Windows (Uw = 1.20)			14.2300	1.1450	16.2939			(27)					
Ground Floor			48.9400	0.1200	5.8728	84.0000	4110.9600	(28a)					
Brick and Block	142.6900	16.3500	126.3400	0.2400	30.3216	42.2200	5334.0748	(29a)					
Pitched Roof	48.9400		48.9400	0.1000	4.8940	9.1000	445.3540	(30)					
Total net area of external elements Aum(A, m2)			240.5700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7143			(33)					
GF Stud			32.0000			9.0000	288.0000	(32c)					
First Floor			118.2700			9.0000	1064.4300	(32c)					
GF Block			50.0400			75.0000	3753.0000	(32c)					
Internal Floor 1			48.9400			18.0000	880.9200	(32d)					
Internal Ceiling 1			48.9400			18.0000	880.9200	(32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16757.6588	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							171.2062	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7405	(36)					
Total fabric heat loss						(33) + (36) =	65.4548	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 47.5950	Feb 46.7627	Mar 46.7627	Apr 45.7382	May 45.9852	Jun 45.4974	Jul 45.4974	Aug 45.2626	Sep 45.2626	Oct 45.9852	Nov 45.7382	Dec 45.9852	(38)
Heat transfer coeff	113.0498	112.2175	112.2175	111.1931	111.4400	110.9522	110.9522	110.7174	110.7174	111.4400	111.1931	111.4400	(39)
Average = Sum(39)m / 12 =												111.4609	(39)
HLP	Jan 1.1550	Feb 1.1465	Mar 1.1465	Apr 1.1360	May 1.1385	Jun 1.1336	Jul 1.1336	Aug 1.1312	Sep 1.1312	Oct 1.1385	Nov 1.1360	Dec 1.1385	(40)
HLP (average)												1.1388	(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												2.7190 (42)
Average daily hot water use (litres/day)												98.7766 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.6543	104.7032	100.7521	96.8011	92.8500	88.8989	88.8989	92.8500	96.8011	100.7521	104.7032	108.6543 (44)
Energy conte	161.1311	140.9263	145.4233	126.7836	121.6519	104.9763	97.2760	111.6256	112.9588	131.6426	143.6982	156.0469 (45)
Energy content (annual)										Total = Sum(45)m =		1554.1405 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	24.1697	21.1389	21.8135	19.0175	18.2478	15.7464	14.5914	16.7438	16.9438	19.7464	21.5547	23.4070 (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	27.5632	24.8939	27.5494	26.6308	27.4950	26.5808	27.4500	27.4791	26.6081	27.5260	26.6600	27.5550 (61)
Total heat required for water heating calculated for each month	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019 (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	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	60.4669	53.0815	55.2406	48.8132	47.3230	41.5498	39.2068	43.9853	44.2108	50.6527	54.4446	58.7743 (65)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Total per year (kWh/year) = Sum(64)m =												1878.1319 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.9688	53.2638	43.3170	32.7938	24.5137	20.6955	22.3622	29.0673	39.0140	49.5373	57.8173	61.6355	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	377.3944	381.3105	371.4419	350.4328	323.9125	298.9872	282.3355	278.4194	288.2880	309.2971	335.8174	360.7427	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	(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)	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	(71)
Water heating gains (Table 5)	81.2727	78.9903	74.2481	67.7962	63.6062	57.7081	52.6972	59.1200	61.4039	68.0815	75.6176	78.9978	(72)
Total internal gains	630.0493	624.9780	600.4204	562.4361	523.4458	488.8042	468.8084	478.0201	500.1193	538.3293	580.6657	612.7894	(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			4.3200		13.4684		0.6300		0.7000		0.7700		17.7817 (74)
East			0.6600		25.1733		0.6300		0.7000		0.7700		5.0776 (76)
South			7.4900		56.5862		0.6300		0.7000		0.7700		129.5282 (78)
West			1.7600		25.1733		0.6300		0.7000		0.7700		13.5402 (80)
Solar gains	165.9276	240.1575	335.7675	423.4774	453.5949	502.3522	463.6685	437.1792	382.2552	286.5221	197.9436		134.5481 (83)
Total gains	795.9768	865.1355	936.1879	985.9135	977.0406	991.1563	932.4769	915.1993	882.3746	824.8514	778.6093		747.3375 (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	41.1757	41.4811	41.4811	41.8633	41.7705	41.9541	41.9541	42.0431	42.0431	41.7705	41.8633	41.7705	
alpha	3.7450	3.7654	3.7654	3.7909	3.7847	3.7969	3.7969	3.8029	3.8029	3.7847	3.7909	3.7847	
util living area	0.9703	0.9586	0.9292	0.8642	0.7480	0.5396	0.3857	0.3806	0.6358	0.8570	0.9467	0.9748	(86)
MIT	19.7637	19.9078	20.1894	20.5384	20.8083	20.9602	20.9917	20.9924	20.9242	20.6349	20.1772	19.7486	(87)
Th 2	19.9562	19.9631	19.9631	19.9715	19.9695	19.9735	19.9735	19.9755	19.9755	19.9695	19.9715	19.9695	(88)
util rest of house	0.9634	0.9492	0.9126	0.8315	0.6857	0.4431	0.2691	0.2620	0.5423	0.8145	0.9322	0.9687	(89)
MIT 2	18.8635	19.0092	19.2814	19.6152	19.8470	19.9571	19.9719	19.9740	19.9394	19.7066	19.2809	18.8595	(90)
Living area fraction									fLA = Living area / (4) =			0.2144	(91)
MIT	19.0565	19.2019	19.4761	19.8132	20.0532	20.1723	20.1906	20.1924	20.1506	19.9057	19.4731	19.0501	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0565	19.2019	19.4761	19.8132	20.0532	20.1723	20.1906	20.1924	20.1506	19.9057	19.4731	19.0501	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9558	0.9405	0.9033	0.8257	0.6912	0.4626	0.2943	0.2876	0.5594	0.8115	0.9236	0.9618	(94)
Ext temp.	760.7978	813.6836	845.6836	814.0976	675.3753	458.5377	274.4092	263.1921	493.5707	669.3505	719.1093	718.8133	(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	1521.2573	1481.4890	1332.7104	1080.0409	774.8605	474.0158	276.3345	264.8829	525.9729	869.8671	1209.0142	1487.7380	(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	565.7818	448.7636	362.3480	191.4792	74.0169	0.0000	0.0000	0.0000	0.0000	149.1844	352.7316	572.0799	(98)
RHI space heating demand												2716.3854	(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	48.9400 (1b)	x 2.3900 (2b)	= 116.9666 (1b) - (3b)
First floor	48.9400 (1c)	x 2.6700 (2c)	= 130.6698 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.6364 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1615 (8)
Pressure test					Yes
Measured/design AP50					3.6800
Infiltration rate					0.3455 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3455 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4405	0.4319	0.4233	0.3801	0.3714	0.3283	0.3283	0.3196	0.3455	0.3714	0.3887	0.4060 (22b)
	0.5970	0.5933	0.5896	0.5722	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5756	0.5824 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.2300	1.1450	16.2939		(27)
Ground Floor			48.9400	0.1200	5.8728	84.0000	4110.9600 (28a)
Brick and Block	142.6900	16.3500	126.3400	0.2400	30.3216	42.2200	5334.0748 (29a)
Pitched Roof	48.9400		48.9400	0.1000	4.8940	9.1000	445.3540 (30)
Total net area of external elements Aum(A, m ²)			240.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7143		(33)
GF Stud			32.0000			9.0000	288.0000 (32c)
First Floor			118.2700			9.0000	1064.4300 (32c)
GF Block			50.0400			75.0000	3753.0000 (32c)
Internal Floor 1			48.9400			18.0000	880.9200 (32d)
Internal Ceiling 1			48.9400			18.0000	880.9200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16757.6588 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							171.2062 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7405 (36)
Total fabric heat loss						(33) + (36) =	65.4548 (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	48.7902	48.4822	48.1804	46.7627	46.4974	45.2626	45.2626	45.0339	45.7382	46.4974	47.0340	47.5950 (38)
Heat transfer coeff	114.2450	113.9371	113.6352	112.2175	111.9522	110.7174	110.7174	110.4888	111.1931	111.9522	112.4888	113.0498 (39)
Average = Sum(39)m / 12 =												112.2162 (39)
HLP	1.1672	1.1640	1.1610	1.1465	1.1438	1.1312	1.1312	1.1288	1.1360	1.1438	1.1493	1.1550 (40)
HLP (average)												1.1465 (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												2.7190 (42)
Average daily hot water use (litres/day)												98.7766 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.6543	104.7032	100.7521	96.8011	92.8500	88.8989	88.8989	92.8500	96.8011	100.7521	104.7032	108.6543 (44)
Energy conte	161.1311	140.9263	145.4233	126.7836	121.6519	104.9763	97.2760	111.6256	112.9588	131.6426	143.6982	156.0469 (45)
Energy content (annual)										Total = Sum(45)m =		1554.1405 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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Distribution loss (46)m = 0.15 x (45)m	24.1697	21.1389	21.8135	19.0175	18.2478	15.7464	14.5914	16.7438	16.9438	19.7464	21.5547	23.4070 (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	27.5632	24.8939	27.5494	26.6308	27.4950	26.5808	27.4500	27.4791	26.6081	27.5260	26.6600	27.5550 (61)
Total heat required for water heating calculated for each month	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019 (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	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019 (64)
Heat gains from water heating, kWh/month	60.4669	53.0815	55.2406	48.8132	47.3230	41.5498	39.2068	43.9853	44.2108	50.6527	54.4446	58.7743 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1878.1319 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.9688	53.2638	43.3170	32.7938	24.5137	20.6955	22.3622	29.0673	39.0140	49.5373	57.8173	61.6355 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	377.3944	381.3105	371.4419	350.4328	323.9125	298.9872	282.3355	278.4194	288.2880	309.2971	335.8174	360.7427 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331 (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)	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606 (71)
Water heating gains (Table 5)	81.2727	78.9903	74.2481	67.7962	63.6062	57.7081	52.6972	59.1200	61.4039	68.0815	75.6176	78.9978 (72)
Total internal gains	630.0493	624.9780	600.4204	562.4361	523.4458	488.8042	468.8084	478.0201	500.1193	538.3293	580.6657	612.7894 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	4.3200	10.6334	0.6300	0.7000	0.7700	14.0387 (74)
East	0.6600	19.6403	0.6300	0.7000	0.7700	3.9615 (76)
South	7.4900	46.7521	0.6300	0.7000	0.7700	107.0174 (78)
West	1.7600	19.6403	0.6300	0.7000	0.7700	10.5641 (80)

Solar gains	135.5817	230.5108	315.6433	393.8068	445.2294	444.2710	427.3509	388.3485	342.4580	254.6949	162.2824	116.1214 (83)
Total gains	765.6310	855.4888	916.0637	956.2429	968.6752	933.0752	896.1594	866.3685	842.5773	793.0242	742.9481	728.9108 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	40.7449	40.8551	40.9636	41.4811	41.5794	42.0431	42.0431	42.1301	41.8633	41.5794	41.3810	41.1757
alpha	3.7163	3.7237	3.7309	3.7654	3.7720	3.8029	3.8029	3.8087	3.7909	3.7720	3.7587	3.7450
util living area	0.9796	0.9680	0.9470	0.9027	0.8180	0.6719	0.5178	0.5522	0.7527	0.9108	0.9670	0.9828 (86)
MIT	19.5265	19.7184	20.0057	20.3674	20.6816	20.8952	20.9703	20.9617	20.8294	20.4343	19.9198	19.4902 (87)
Th 2	19.9463	19.9489	19.9514	19.9631	19.9652	19.9755	19.9755	19.9774	19.9715	19.9652	19.9608	19.9562 (88)
util rest of house	0.9751	0.9609	0.9349	0.8792	0.7720	0.5906	0.4082	0.4434	0.6808	0.8846	0.9585	0.9789 (89)
MIT 2	18.6216	18.8121	19.0947	19.4505	19.7380	19.9189	19.9653	19.9631	19.8699	19.5212	19.0219	18.5934 (90)
Living area fraction									fLA = Living area / (4) =			0.2144 (91)
MIT	18.8157	19.0065	19.2901	19.6471	19.9404	20.1283	20.1808	20.1773	20.0757	19.7170	19.2145	18.7857 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8157	19.0065	19.2901	19.6471	19.9404	20.1283	20.1808	20.1773	20.0757	19.7170	19.2145	18.7857 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9687	0.9529	0.9256	0.8708	0.7707	0.6037	0.4311	0.4658	0.6889	0.8770	0.9507	0.9732 (94)
Ext temp.	741.6897	815.2096	847.8639	832.7096	746.5885	563.2644	386.3098	403.5396	580.4346	695.5005	706.3509	709.3817 (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	1658.3408	1607.2494	1453.4030	1206.0169	922.5290	612.0753	396.4562	417.3459	664.4556	1020.6674	1362.7442	1648.9128 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating	681.9885	532.2507	450.5211	268.7813	130.8997	0.0000	0.0000	0.0000	0.0000	241.9241	472.6031	699.0111 (98)
Space heating per m2												3477.9797 (98)
(98) / (4) = 35.5331 (99)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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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													3834.5973	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	681.9885	532.2507	450.5211	268.7813	130.8997	0.0000	0.0000	0.0000	0.0000	241.9241	472.6031	699.0111	(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)	751.9167	586.8255	496.7156	296.3410	144.3217	0.0000	0.0000	0.0000	0.0000	266.7300	521.0619	770.6848	(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	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019	(64)	
Efficiency of water heater (217)m	90.0781	90.0189	89.9055	89.6622	89.1869	87.9000	87.9000	87.9000	87.9000	89.5678	89.9409	90.1029	(216)	
Fuel for water heating, kWh/month	209.4785	184.2061	192.3939	171.1027	167.2294	149.6668	141.8953	158.2534	158.7791	177.7074	189.4113	203.7691	(219)	
Water heating fuel used												2103.8931	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3834.5973	(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)													423.6271	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424			-630.4424	(233)
Total delivered energy for all uses													5806.6751	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3834.5973	3.4800	133.4440
Space heating - secondary	0.0000	0.0000	0.0000
Water heating (other fuel)	2103.8931	3.4800	73.2155
Pumps and fans for heating	75.0000	13.1900	9.8925
Energy for lighting	423.6271	13.1900	55.8764
Additional standing charges			120.0000
Energy saving/generation technologies			
PV Unit	-630.4424	13.1900	-83.1553
Total energy cost			309.2730

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9091	(257)
SAP value		87.3178	
SAP rating (Section 12)		87	(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	3834.5973	0.2160	828.2730
Space heating - secondary	0.0000	0.0000	0.0000
Water heating (other fuel)	2103.8931	0.2160	454.4409
Space and water heating			1282.7139
Pumps and fans	75.0000	0.5190	38.9250
Energy for lighting	423.6271	0.5190	219.8624
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996
Total kg/year			1214.3018
CO2 emissions per m2			12.4100
EI value			88.6117
EI rating			89
EI band			B

Calculation of stars for heating and DHW

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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	$3.48 / 0.8917 = 3.903$, stars = 4
Water heating environmental impact	$0.216 / 0.8917 = 0.2422$, 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	48.9400 (1b)	x 2.3900 (2b)	= 116.9666 (1b) - (3b)
First floor	48.9400 (1c)	x 2.6700 (2c)	= 130.6698 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.6364 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1615 (8)
Pressure test					Yes
Measured/design AP50					3.6800
Infiltration rate					0.3455 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3455 (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	0.4060	0.3901	0.3901	0.3455	0.3542	0.3369	0.3369	0.3283	0.3283	0.3542	0.3455	0.3542 (22b)
Effective ac	0.5824	0.5722	0.5722	0.5597	0.5627	0.5567	0.5567	0.5539	0.5539	0.5627	0.5597	0.5627 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.2300	1.1450	16.2939		(27)
Ground Floor			48.9400	0.1200	5.8728	84.0000	4110.9600 (28a)
Brick and Block	142.6900	16.3500	126.3400	0.2400	30.3216	42.2200	5334.0748 (29a)
Pitched Roof	48.9400		48.9400	0.1000	4.8940	9.1000	445.3540 (30)
Total net area of external elements Aum(A, m ²)			240.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7143		(33)
GF Stud			32.0000			9.0000	288.0000 (32c)
First Floor			118.2700			9.0000	1064.4300 (32c)
GF Block			50.0400			75.0000	3753.0000 (32c)
Internal Floor 1			48.9400			18.0000	880.9200 (32d)
Internal Ceiling 1			48.9400			18.0000	880.9200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16757.6588 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							171.2062 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7405 (36)
Total fabric heat loss						(33) + (36) =	65.4548 (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
	47.5950	46.7627	46.7627	45.7382	45.9852	45.4974	45.4974	45.2626	45.2626	45.9852	45.7382	45.9852 (38)
Heat transfer coeff	113.0498	112.2175	112.2175	111.1931	111.4400	110.9522	110.9522	110.7174	110.7174	111.4400	111.1931	111.4400 (39)
Average = Sum(39)m / 12 =												111.4609 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1550	1.1465	1.1465	1.1360	1.1385	1.1336	1.1336	1.1312	1.1312	1.1385	1.1360	1.1385 (40)
HLP (average)												1.1388 (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												2.7190 (42)
Average daily hot water use (litres/day)												98.7766 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.6543	104.7032	100.7521	96.8011	92.8500	88.8989	88.8989	92.8500	96.8011	100.7521	104.7032	108.6543 (44)
Energy conte	161.1311	140.9263	145.4233	126.7836	121.6519	104.9763	97.2760	111.6256	112.9588	131.6426	143.6982	156.0469 (45)
Energy content (annual)										Total = Sum(45)m =		1554.1405 (45)

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Distribution loss (46)m = 0.15 x (45)m	24.1697	21.1389	21.8135	19.0175	18.2478	15.7464	14.5914	16.7438	16.9438	19.7464	21.5547	23.4070 (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	27.5632	24.8939	27.5494	26.6308	27.4950	26.5808	27.4500	27.4791	26.6081	27.5260	26.6600	27.5550 (61)
Total heat required for water heating calculated for each month	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019 (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	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019 (64)
Heat gains from water heating, kWh/month	60.4669	53.0815	55.2406	48.8132	47.3230	41.5498	39.2068	43.9853	44.2108	50.6527	54.4446	58.7743 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1878.1319 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.9688	53.2638	43.3170	32.7938	24.5137	20.6955	22.3622	29.0673	39.0140	49.5373	57.8173	61.6355 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	377.3944	381.3105	371.4419	350.4328	323.9125	298.9872	282.3355	278.4194	288.2880	309.2971	335.8174	360.7427 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331 (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)	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606 (71)
Water heating gains (Table 5)	81.2727	78.9903	74.2481	67.7962	63.6062	57.7081	52.6972	59.1200	61.4039	68.0815	75.6176	78.9978 (72)
Total internal gains	630.0493	624.9780	600.4204	562.4361	523.4458	488.8042	468.8084	478.0201	500.1193	538.3293	580.6657	612.7894 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	4.3200	13.4684	0.6300	0.7000	0.7700	17.7817 (74)
East	0.6600	25.1733	0.6300	0.7000	0.7700	5.0776 (76)
South	7.4900	56.5862	0.6300	0.7000	0.7700	129.5282 (78)
West	1.7600	25.1733	0.6300	0.7000	0.7700	13.5402 (80)

Solar gains	165.9276	240.1575	335.7675	423.4774	453.5949	502.3522	463.6685	437.1792	382.2552	286.5221	197.9436	134.5481 (83)
Total gains	795.9768	865.1355	936.1879	985.9135	977.0406	991.1563	932.4769	915.1993	882.3746	824.8514	778.6093	747.3375 (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	41.1757	41.4811	41.4811	41.8633	41.7705	41.9541	41.9541	42.0431	42.0431	41.7705	41.8633	41.7705
alpha	3.7450	3.7654	3.7654	3.7909	3.7847	3.7969	3.7969	3.8029	3.8029	3.7847	3.7909	3.7847
util living area	0.9703	0.9586	0.9292	0.8642	0.7480	0.5396	0.3857	0.3806	0.6358	0.8570	0.9467	0.9748 (86)
MIT	19.7637	19.9078	20.1894	20.5384	20.8083	20.9602	20.9917	20.9924	20.9242	20.6349	20.1772	19.7486 (87)
Th 2	19.9562	19.9631	19.9631	19.9715	19.9695	19.9735	19.9735	19.9755	19.9755	19.9695	19.9715	19.9695 (88)
util rest of house	0.9634	0.9492	0.9126	0.8315	0.6857	0.4431	0.2691	0.2620	0.5423	0.8145	0.9322	0.9687 (89)
MIT 2	18.8635	19.0092	19.2814	19.6152	19.8470	19.9571	19.9719	19.9740	19.9394	19.7066	19.2809	18.8595 (90)
Living area fraction									fLA = Living area / (4) =			0.2144 (91)
MIT	19.0565	19.2019	19.4761	19.8132	20.0532	20.1723	20.1906	20.1924	20.1506	19.9057	19.4731	19.0501 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0565	19.2019	19.4761	19.8132	20.0532	20.1723	20.1906	20.1924	20.1506	19.9057	19.4731	19.0501 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9558	0.9405	0.9033	0.8257	0.6912	0.4626	0.2943	0.2876	0.5594	0.8115	0.9236	0.9618 (94)
Ext temp.	760.7978	813.6860	845.6836	814.0976	675.3753	458.5377	274.4092	263.1921	493.5707	669.3505	719.1093	718.8133 (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	1521.2573	1481.4890	1332.7104	1080.0409	774.8605	474.0158	276.3345	264.8829	525.9729	869.8671	1209.0142	1487.7380 (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	565.7818	448.7636	362.3480	191.4792	74.0169	0.0000	0.0000	0.0000	0.0000	149.1844	352.7316	572.0799 (98)
Space heating per m2												2716.3854 (98)
(98) / (4) = 27.7522 (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													2994.9122 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	565.7818	448.7636	362.3480	191.4792	74.0169	0.0000	0.0000	0.0000	0.0000	149.1844	352.7316	572.0799	(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)	623.7948	494.7780	399.5016	211.1127	81.6063	0.0000	0.0000	0.0000	0.0000	164.4811	388.8992	630.7386	(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	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019	(64)
Efficiency of water heater (217)m	89.9831	89.9271	89.7760	89.4328	88.8093	87.9000	87.9000	87.9000	87.9000	89.2328	89.7687	90.0034	(216)
Fuel for water heating, kWh/month	209.6997	184.3941	192.6715	171.5416	167.9405	149.6668	141.8953	158.2534	158.7791	178.3746	189.7745	203.9944	(219)
Water heating fuel used												2106.9855	(219)
Annual totals kWh/year													
Space heating fuel - main system												2994.9122	(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)												423.6271	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1206 * 1.00) =										-704.3100		-704.3100	(233)
Total delivered energy for all uses												4896.2148	(238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2994.9122	3.6300	108.7153 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2106.9855	3.6300	76.4836 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	423.6271	19.4400	82.3531 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-704.3100	19.4400	-136.9179 (252)
Total energy cost			240.2141 (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	2994.9122	0.2160	646.9010 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2106.9855	0.2160	455.1089 (264)
Space and water heating			1102.0099 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	423.6271	0.5190	219.8624 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	0.5190	-365.5369 (269)
Total kg/year			995.2605 (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	2994.9122	1.2200	3653.7929 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2106.9855	1.2200	2570.5223 (264)
Space and water heating			6224.3153 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	423.6271	3.0700	1300.5351 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	3.0700	-2162.2316 (269)
Primary energy kWh/year			5592.8687 (272)
Primary energy kWh/m2/year			57.1401 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 87
Current environmental impact rating: B 89

(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	+ 1.1	-£ 27	-194 kg (19.5%)

		Typical annual savings	Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£27	1.98 kg/m²	B 88	B 90
Total Savings	£27	1.98 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 490 TEST (31 Jan 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	£97	£107	-£10
Mains gas	£280	£243	£37
Space heating	£218	£218	£0
Water heating	£76	£49	£27
Lighting	£82	£82	£0
Generated (PV)	-£137	-£137	£0
Total cost of fuels	£240	£213	£27
Total cost of uses	£239	£212	£27
Delivered energy	50 kWh/m²	40 kWh/m²	10 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.8 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	8 kg/m²	2 kg/m²
Primary energy	57 kWh/m²	46 kWh/m²	11 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	48.9400 (1b)	x 2.3900 (2b)	= 116.9666 (1b) - (3b)
First floor	48.9400 (1c)	x 2.6700 (2c)	= 130.6698 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.6364 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1615 (8)
Pressure test					Yes
Measured/design AP50					3.6800
Infiltration rate					0.3455 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3455 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4405	0.4319	0.4233	0.3801	0.3714	0.3283	0.3283	0.3196	0.3455	0.3714	0.3887	0.4060 (22b)
	0.5970	0.5933	0.5896	0.5722	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5756	0.5824 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.2300	1.1450	16.2939		(27)
Ground Floor			48.9400	0.1200	5.8728	84.0000	4110.9600 (28a)
Brick and Block	142.6900	16.3500	126.3400	0.2400	30.3216	42.2200	5334.0748 (29a)
Pitched Roof	48.9400		48.9400	0.1000	4.8940	9.1000	445.3540 (30)
Total net area of external elements Aum(A, m ²)			240.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7143		(33)
GF Stud			32.0000			9.0000	288.0000 (32c)
First Floor			118.2700			9.0000	1064.4300 (32c)
GF Block			50.0400			75.0000	3753.0000 (32c)
Internal Floor 1			48.9400			18.0000	880.9200 (32d)
Internal Ceiling 1			48.9400			18.0000	880.9200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16757.6588 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 171.2062 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.7405 (36)
Total fabric heat loss (33) + (36) = 65.4548 (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	48.7902	48.4822	48.1804	46.7627	46.4974	45.2626	45.2626	45.0339	45.7382	46.4974	47.0340	47.5950 (38)
Heat transfer coeff	114.2450	113.9371	113.6352	112.2175	111.9522	110.7174	110.7174	110.4888	111.1931	111.9522	112.4888	113.0498 (39)
Average = Sum(39)m / 12 =												112.2162 (39)
HLP	1.1672	1.1640	1.1610	1.1465	1.1438	1.1312	1.1312	1.1288	1.1360	1.1438	1.1493	1.1550 (40)
HLP (average)												1.1465 (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												2.7190 (42)
Average daily hot water use (litres/day)												98.7766 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.6543	104.7032	100.7521	96.8011	92.8500	88.8989	88.8989	92.8500	96.8011	100.7521	104.7032	108.6543 (44)
Energy conte	161.1311	140.9263	145.4233	126.7836	121.6519	104.9763	97.2760	111.6256	112.9588	131.6426	143.6982	156.0469 (45)
Energy content (annual)										Total = Sum(45)m =		1554.1405 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	24.1697	21.1389	21.8135	19.0175	18.2478	15.7464	14.5914	16.7438	16.9438	19.7464	21.5547	23.4070 (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	27.5632	24.8939	27.5494	26.6308	27.4950	26.5808	27.4500	27.4791	26.6081	27.5260	26.6600	27.5550 (61)
Total heat required for water heating calculated for each month	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019 (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												1.1669 (H8)
Utilisation factor												0.5755 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												98.7766 (H14)
Volume ratio Veff/V												0.7593 (H15)
Solar storage volume factor												0.9449 (H16)
Solar input												-867.2580 (H17)
Solar input	-25.1488	-41.9660	-71.4730	-95.7879	-118.3378	-116.3449	-114.8074	-100.3078	-78.5611	-53.6480	-29.8300	-21.0452 (63)
Solar input (sum of months) = Sum (63)m =												-867.2580 (63)
Output from w/h	163.5456	123.8542	101.4997	57.6266	30.8090	15.2122	9.9185	38.7970	61.0057	105.5206	140.5281	162.5567 (64)
Total per year (kWh/year) = Sum (64)m =												1010.8739 (64)
Heat gains from water heating, kWh/month	60.4669	53.0815	55.2406	48.8132	47.3230	41.5498	39.2068	43.9853	44.2108	50.6527	54.4446	58.7743 (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	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.9688	53.2638	43.3170	32.7938	24.5137	20.6955	22.3622	29.0673	39.0140	49.5373	57.8173	61.6355	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	377.3944	381.3105	371.4419	350.4328	323.9125	298.9872	282.3355	278.4194	288.2880	309.2971	335.8174	360.7427	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	(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)	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	(71)
Water heating gains (Table 5)	81.2727	78.9903	74.2481	67.7962	63.6062	57.7081	52.6972	59.1200	61.4039	68.0815	75.6176	78.9978	(72)
Total internal gains	630.0493	624.9780	600.4204	562.4361	523.4458	488.8042	468.8084	478.0201	500.1193	538.3293	580.6657	612.7894	(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					4.3200	10.6334	0.6300	0.7000	0.7700	14.0387 (74)		
East					0.6600	19.6403	0.6300	0.7000	0.7700	3.9615 (76)		
South					7.4900	46.7521	0.6300	0.7000	0.7700	107.0174 (78)		
West					1.7600	19.6403	0.6300	0.7000	0.7700	10.5641 (80)		

Solar gains	135.5817	230.5108	315.6433	393.8068	445.2294	444.2710	427.3509	388.3485	342.4580	254.6949	162.2824	116.1214 (83)
Total gains	765.6310	855.4888	916.0637	956.2429	968.6752	933.0752	896.1594	866.3685	842.5773	793.0242	742.9481	728.9108 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.7449	40.8551	40.9636	41.4811	41.5794	42.0431	42.0431	42.1301	41.8633	41.5794	41.3810	41.1757	
alpha	3.7163	3.7237	3.7309	3.7654	3.7720	3.8029	3.8029	3.8087	3.7909	3.7720	3.7587	3.7450	
util living area	0.9796	0.9680	0.9470	0.9027	0.8180	0.6719	0.5178	0.5522	0.7527	0.9108	0.9670	0.9828 (86)	
MIT	19.5265	19.7184	20.0057	20.3674	20.6816	20.8952	20.9703	20.9617	20.8294	20.4343	19.9198	19.4902 (87)	
Th 2	19.9463	19.9489	19.9514	19.9631	19.9652	19.9755	19.9755	19.9774	19.9715	19.9652	19.9608	19.9562 (88)	
util rest of house	0.9751	0.9609	0.9349	0.8792	0.7720	0.5906	0.4082	0.4434	0.6808	0.8846	0.9585	0.9789 (89)	
MIT 2	18.6216	18.8121	19.0947	19.4505	19.7380	19.9189	19.9653	19.9631	19.8699	19.5212	19.0219	18.5934 (90)	
Living area fraction									fLA = Living area / (4) =			0.2144 (91)	
MIT	18.8157	19.0065	19.2901	19.6471	19.9404	20.1283	20.1808	20.1773	20.0757	19.7170	19.2145	18.7857 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.8157	19.0065	19.2901	19.6471	19.9404	20.1283	20.1808	20.1773	20.0757	19.7170	19.2145	18.7857 (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	0.9687	0.9529	0.9256	0.8708	0.7707	0.6037	0.4311	0.4658	0.6889	0.8770	0.9507	0.9732	(94)
Useful gains	741.6897	815.2096	847.8639	832.7096	746.5885	563.2644	386.3098	403.5396	580.4346	695.5005	706.3509	709.3817	(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	1658.3408	1607.2494	1453.4030	1206.0169	922.5290	612.0753	396.4562	417.3459	664.4556	1020.6674	1362.7442	1648.9128	(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	681.9885	532.2507	450.5211	268.7813	130.8997	0.0000	0.0000	0.0000	0.0000	241.9241	472.6031	699.0111	(98)
Space heating												3477.9797	(98)
Space heating per m2											(98) / (4) =	35.5331	(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													3834.5973	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	681.9885	532.2507	450.5211	268.7813	130.8997	0.0000	0.0000	0.0000	0.0000	241.9241	472.6031	699.0111	(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)	751.9167	586.8255	496.7156	296.3410	144.3217	0.0000	0.0000	0.0000	0.0000	266.7300	521.0619	770.6848	(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	163.5456	123.8542	101.4997	57.6266	30.8090	15.2122	9.9185	38.7970	61.0057	105.5206	140.5281	162.5567	(64)	
Efficiency of water heater	90.1446	90.1579	90.1719	90.1928	90.1529	87.9000	87.9000	87.9000	87.9000	89.8309	90.0426	90.1581	(217)	
Fuel for water heating, kWh/month	181.4259	137.3748	112.5625	63.8927	34.1742	17.3063	11.2839	44.1376	69.4036	117.4657	156.0685	180.3018	(219)	
Water heating fuel used												1125.3974	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3834.5973	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													423.6271	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424			-630.4424	(233)
Total delivered energy for all uses													4878.1793	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3834.5973	3.4800	133.4440 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1125.3974	3.4800	39.1638 (247)
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	423.6271	13.1900	55.8764 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-630.4424	13.1900	-83.1553 (252)
Total energy cost			281.8164 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.8284 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	88.4437
SAP rating (Section 12)		88 (258)
SAP band		B

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3834.5973	0.2160	828.2730 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1125.3974	0.2160	243.0858 (264)
Space and water heating			1071.3588 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	423.6271	0.5190	219.8624 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			1028.8967 (272)
CO2 emissions per m2			10.5100 (273)
EI value			90.3505
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	48.9400 (1b)	x 2.3900 (2b)	= 116.9666 (1b) - (3b)
First floor	48.9400 (1c)	x 2.6700 (2c)	= 130.6698 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.6364 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1615 (8)
Pressure test					Yes
Measured/design AP50					3.6800
Infiltration rate					0.3455 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3455 (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	0.4060	0.3901	0.3901	0.3455	0.3542	0.3369	0.3369	0.3283	0.3283	0.3542	0.3455	0.3542 (22b)
Effective ac	0.5824	0.5722	0.5722	0.5597	0.5627	0.5567	0.5567	0.5539	0.5539	0.5627	0.5597	0.5627 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			14.2300	1.1450	16.2939		(27)
Ground Floor			48.9400	0.1200	5.8728	84.0000	4110.9600 (28a)
Brick and Block	142.6900	16.3500	126.3400	0.2400	30.3216	42.2200	5334.0748 (29a)
Pitched Roof	48.9400		48.9400	0.1000	4.8940	9.1000	445.3540 (30)
Total net area of external elements Aum(A, m ²)			240.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.7143		(33)
GF Stud			32.0000			9.0000	288.0000 (32c)
First Floor			118.2700			9.0000	1064.4300 (32c)
GF Block			50.0400			75.0000	3753.0000 (32c)
Internal Floor 1			48.9400			18.0000	880.9200 (32d)
Internal Ceiling 1			48.9400			18.0000	880.9200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16757.6588 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							171.2062 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7405 (36)
Total fabric heat loss						(33) + (36) =	65.4548 (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	47.5950	46.7627	46.7627	45.7382	45.9852	45.4974	45.4974	45.2626	45.2626	45.9852	45.7382	45.9852 (38)
Heat transfer coeff	113.0498	112.2175	112.2175	111.1931	111.4400	110.9522	110.9522	110.7174	110.7174	111.4400	111.1931	111.4400 (39)
Average = Sum(39)m / 12 =												111.4609 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1550	1.1465	1.1465	1.1360	1.1385	1.1336	1.1336	1.1312	1.1312	1.1385	1.1360	1.1385 (40)
HLP (average)												1.1388 (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												2.7190 (42)
Average daily hot water use (litres/day)												98.7766 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.6543	104.7032	100.7521	96.8011	92.8500	88.8989	88.8989	92.8500	96.8011	100.7521	104.7032	108.6543 (44)
Energy conte	161.1311	140.9263	145.4233	126.7836	121.6519	104.9763	97.2760	111.6256	112.9588	131.6426	143.6982	156.0469 (45)
Energy content (annual)										Total = Sum(45)m =		1554.1405 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	24.1697	21.1389	21.8135	19.0175	18.2478	15.7464	14.5914	16.7438	16.9438	19.7464	21.5547	23.4070 (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	27.5632	24.8939	27.5494	26.6308	27.4950	26.5808	27.4500	27.4791	26.6081	27.5260	26.6600	27.5550 (61)
Total heat required for water heating calculated for each month	188.6944	165.8203	172.9727	153.4144	149.1468	131.5572	124.7259	139.1047	139.5669	159.1686	170.3582	183.6019 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3037 (H8)
Utilisation factor												0.5356 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												98.7766 (H14)
Volume ratio Veff/V												0.7593 (H15)
Solar storage volume factor												0.9449 (H16)
Solar input												-901.6788 (H17)
Solar input	-29.4229	-41.8427	-72.6079	-97.6699	-113.4990	-123.4539	-117.0532	-106.7411	-83.5461	-57.7440	-34.8006	-23.2975 (63)
Solar input (sum of months) = Sum (63)m =												-901.6788 (63)
Output from w/h	159.2714	123.9775	100.3648	55.7446	35.6479	8.1032	7.6728	32.3636	56.0208	101.4245	135.5575	160.3044 (64)
Total per year (kWh/year) = Sum (64)m =												976.4531 (64)
Heat gains from water heating, kWh/month	60.4669	53.0815	55.2406	48.8132	47.3230	41.5498	39.2068	43.9853	44.2108	50.6527	54.4446	58.7743 (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	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	163.1409	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.9688	53.2638	43.3170	32.7938	24.5137	20.6955	22.3622	29.0673	39.0140	49.5373	57.8173	61.6355	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	377.3944	381.3105	371.4419	350.4328	323.9125	298.9872	282.3355	278.4194	288.2880	309.2971	335.8174	360.7427	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	54.0331	(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)	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	-108.7606	(71)
Water heating gains (Table 5)	81.2727	78.9903	74.2481	67.7962	63.6062	57.7081	52.6972	59.1200	61.4039	68.0815	75.6176	78.9978	(72)
Total internal gains	630.0493	624.9780	600.4204	562.4361	523.4458	488.8042	468.8084	478.0201	500.1193	538.3293	580.6657	612.7894	(73)

6. Solar gains

[Jan]				Area	Solar flux		g	FF		Access	Gains	
				m2	Table 6a	Table 6b	Specific data	Specific data	Specific data	factor	Table 6d	W
					W/m2		or Table 6b	or Table 6c				
North				4.3200	13.4684		0.6300		0.7000		0.7700	17.7817 (74)
East				0.6600	25.1733		0.6300		0.7000		0.7700	5.0776 (76)
South				7.4900	56.5862		0.6300		0.7000		0.7700	129.5282 (78)
West				1.7600	25.1733		0.6300		0.7000		0.7700	13.5402 (80)

Solar gains	165.9276	240.1575	335.7675	423.4774	453.5949	502.3522	463.6685	437.1792	382.2552	286.5221	197.9436	134.5481 (83)
Total gains	795.9768	865.1355	936.1879	985.9135	977.0406	991.1563	932.4769	915.1993	882.3746	824.8514	778.6093	747.3375 (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	41.1757	41.4811	41.4811	41.8633	41.7705	41.9541	41.9541	42.0431	42.0431	41.7705	41.8633	41.7705
alpha	3.7450	3.7654	3.7654	3.7909	3.7847	3.7969	3.7969	3.8029	3.8029	3.7847	3.7909	3.7847
util living area												
	0.9703	0.9586	0.9292	0.8642	0.7480	0.5396	0.3857	0.3806	0.6358	0.8570	0.9467	0.9748 (86)
MIT	19.7637	19.9078	20.1894	20.5384	20.8083	20.9602	20.9917	20.9924	20.9242	20.6349	20.1772	19.7486 (87)
Th 2	19.9562	19.9631	19.9631	19.9715	19.9695	19.9735	19.9735	19.9755	19.9755	19.9695	19.9715	19.9695 (88)
util rest of house												
	0.9634	0.9492	0.9126	0.8315	0.6857	0.4431	0.2691	0.2620	0.5423	0.8145	0.9322	0.9687 (89)
MIT 2	18.8635	19.0092	19.2814	19.6152	19.8470	19.9571	19.9719	19.9740	19.9394	19.7066	19.2809	18.8595 (90)
Living area fraction												
MIT	19.0565	19.2019	19.4761	19.8132	20.0532	20.1723	20.1906	20.1924	20.1506	19.9057	19.4731	19.0501 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0565	19.2019	19.4761	19.8132	20.0532	20.1723	20.1906	20.1924	20.1506	19.9057	19.4731	19.0501 (93)

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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	0.9558	0.9405	0.9033	0.8257	0.6912	0.4626	0.2943	0.2876	0.5594	0.8115	0.9236	0.9618	(94)
Useful gains	760.7978	813.6860	845.6836	814.0976	675.3753	458.5377	274.4092	263.1921	493.5707	669.3505	719.1093	718.8133	(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	1521.2573	1481.4890	1332.7104	1080.0409	774.8605	474.0158	276.3345	264.8829	525.9729	869.8671	1209.0142	1487.7380	(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	565.7818	448.7636	362.3480	191.4792	74.0169	0.0000	0.0000	0.0000	0.0000	149.1844	352.7316	572.0799	(98)
Space heating												2716.3854	(98)
Space heating per m2												(98) / (4) =	27.7522 (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													2994.9122 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	565.7818	448.7636	362.3480	191.4792	74.0169	0.0000	0.0000	0.0000	0.0000	149.1844	352.7316	572.0799	(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)	623.7948	494.7780	399.5016	211.1127	81.6063	0.0000	0.0000	0.0000	0.0000	164.4811	388.8992	630.7386	(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	159.2714	123.9775	100.3648	55.7446	35.6479	8.1032	7.6728	32.3636	56.0208	101.4245	135.5575	160.3044	(64)
Efficiency of water heater	90.0697	90.0789	90.0776	90.0532	89.7705	87.9000	87.9000	87.9000	87.9000	89.5456	89.9049	90.0720	(216)
Fuel for water heating, kWh/month	176.8312	137.6322	111.4204	61.9018	39.7100	9.2187	8.7290	36.8187	63.7324	113.2658	150.7787	177.9736	(219)
Water heating fuel used												1088.0125	(219)
Annual totals kWh/year													
Space heating fuel - main system												2994.9122	(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)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												423.6271	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1206 * 1.00) =									-704.3100			-704.3100	(233)
Total delivered energy for all uses												3927.2419	(238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2994.9122	3.6300	108.7153	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1088.0125	3.6300	39.4949	(247)
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	423.6271	19.4400	82.3531	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-704.3100	19.4400	-136.9179	(252)
Total energy cost			212.9454	(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	2994.9122	0.2160	646.9010	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1088.0125	0.2160	235.0107	(264)
Space and water heating			881.9118	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	423.6271	0.5190	219.8624	(268)
Energy saving/generation technologies				
PV Unit	-704.3100	0.5190	-365.5369	(269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Total kg/year

801.1123 (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	2994.9122	1.2200	3653.7929 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1088.0125	1.2200	1327.3753 (264)
Space and water heating			4981.1682 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	423.6271	3.0700	1300.5351 (268)
Energy saving/generation technologies			
PV Unit	-704.3100	3.0700	-2162.2316 (269)
Primary energy kWh/year			4503.2217 (272)
Primary energy kWh/m2/year			46.0076 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 68	Issued on Date	28/02/2022
Assessment Reference	As Built	Prop Type Ref	G
Project	12 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.19	TER	18.15
Environmental	89 B	% DER<TER	21.83		
CO ₂ Emissions (t/year)	1.00	DFEE	44.89	TFEE	55.29
General Requirements Compliance	Pass	% DFEE<TFEE	18.82		

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 68	Issued on Date	28/02/2022
Assessment Reference	As Built	Prop Type Ref	G
Project	12 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.19	TER	18.15
Environmental	89 B	% DER<TER	21.83		
CO ₂ Emissions (t/year)	1.00	DFEE	44.89	TFEE	55.29
General Requirements Compliance	Pass	% DFEE<TFEE	18.82		

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 68	Issued on Date	28/02/2022
Assessment Reference	As Built	Prop Type Ref	G
Project	12 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.19	TER	18.15
Environmental	89 B	% DER<TER	21.83		
CO ₂ Emissions (t/year)	1.00	DFEE	44.89	TFEE	55.29
General Requirements Compliance	Pass	% DFEE<TFEE	18.82		

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 = 48.94 m², Perimeter = 28.20 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 68	Issued on Date	28/02/2022
Assessment Reference	As Built	Prop Type Ref	G
Property	12 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	87 B	DER	14.19
Environmental	89 B	TER	18.15
CO ₂ Emissions (t/year)	1.00	% DER<TER	21.83
General Requirements Compliance	Pass	DFEE	44.89
		TFEE	55.29
		% DFEE<TFEE	18.82
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	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	28.20 m	48.94 m ²
	1st Storey:	28.20 m	48.94 m ²
			2.39 m
			2.67 m

7.0 Living Area	20.99	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	171.21	kJ/m²K

9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
	Brick and Block	Cavity Wall	Other	0.24	42.22	142.69	126.34

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

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	GF Stud	Plasterboard on timber frame	9.00	32.00
	First Floor	Plasterboard on timber frame	9.00	118.27
	GF Block	Dense block, plasterboard on dabs	75.00	50.04

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
	Pitched Roof	External Plane Roof	Other	0.10	9.10	48.94	48.94

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	48.94

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	48.94

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	48.94

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	North							2.12	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					2.88	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					7.49	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					0.66	
Side Elevation	Window	[1] Brick and Block	West	None	0.00					1.76	
Front Shaded	Window	[1] Brick and Block	North	None	0.66	Yes				1.44	

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)	1.26	0.098	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.93	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	7.20	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	9.38	0.034	No	CD0027
Independently assessed	E4 Jamb	29.40	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	28.20	0.037	No	Knauf P7
Independently assessed	E6 Intermediate floor within a dwelling	28.20	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	12.14	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	16.06	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	20.20	0.050	No	CD0035

Y-value	0.024	W/m²K
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18.0 Pressure Testing

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

19.0 Mechanical Ventilation

Summer Overheating

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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

Mechanical Ventilation

Mechanical Ventilation System Present	No
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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				4
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	22	
Total number of L.E.L. fittings	22	
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)	
Combi boiler type	Standard Combi	
Combi keep hot type	Gas/Oil, time clock	

25.0 Main Heating 2

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.73	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

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