



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 15 Shaw Road
WEST END, SO30 3JZ

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 22/08/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 22			Issued on Date	22/08/2022
Assessment Reference	As Built	Prop Type Ref	Fv		
Property	15 Shaw Road, WEST END, SO30 3JZ				
SAP Rating	89 B	DER	12.15	TER	15.66
Environmental	89 B	% DER<TER	22.41		
CO ₂ Emissions (t/year)	1.42	DFEE	45.08	TFEE	57.01
General Requirements Compliance	Pass	% DFEE<TFEE	20.93		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	15.66	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.15	kgCO ₂ /m ²	Pass
	-3.51 (-22.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.01	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.08	kWh/m ² /yr	
	-11.9 (-20.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.93 (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 4000 GR4700iW 18 S NG

Efficiency: 89.5% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.73 kWh/day
Permitted by DBSCG 2.33

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

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

2.17 m², No overhang

Windows facing East

9.54 m², Overhang twice as wide as window, ratio 1.15

Windows facing South

3.16 m², No overhang

Windows facing West

16.84 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

3.93 (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	0.017	W/m ² K
Air permeability	3.9	m ³ /m ² h
Photovoltaic array	0.97	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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SAP Rating	89 B	DER	12.15
Environmental	89 B	TER	15.66
CO ₂ Emissions (t/year)	1.42	% DER<TER	22.41
General Requirements Compliance	Pass	DFEE	45.08
		TFEE	57.01
		% DFEE<TFEE	20.93
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	2.52	0.19	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	10.98	0.77	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.01	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.54	0.23	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.056	5.54	0.31	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	17.04	0.36	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	54.90	0.88	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.022	40.51	0.89	Knauf P10
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	40.51	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	25.50	1.53	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	15.01	0.66	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	30.30	1.18	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	10.10	-0.92	Knauf P24

Total: **6.15** W/mK:
Y-Value: **0.017** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS BUILT

Detached House, total floor area 158 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) 15.66 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.15 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.1 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: 3.93 (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 4000 GR4700iW 18 S NG

Efficiency: 89.5% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.73 kWh/day
Permitted by DBSCG 2.33 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

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: 2.17 m², No overhang
Windows facing East: 9.54 m², Overhang twice as wide as window, ratio 1.15
Windows facing South: 3.16 m², No overhang
Windows facing West: 16.84 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 0.017 W/m²K
Air permeability 3.9 m³/m²h
Photovoltaic array 0.97 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	79.0100 (1b)	x 2.3900 (2b)	= 188.8339 (1b) - (3b)
First floor	79.0100 (1c)	x 2.6700 (2c)	= 210.9567 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 399.7906 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1251 (8)
Pressure test					Yes
Measured/design AP50					3.9300
Infiltration rate					0.3216 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2733 (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	0.3485	0.3417	0.3348	0.3007	0.2938	0.2597	0.2597	0.2528	0.2733	0.2938	0.3075	0.3212 (22b)
Effective ac	0.5607	0.5584	0.5561	0.5452	0.5432	0.5337	0.5337	0.5320	0.5374	0.5432	0.5473	0.5516 (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)			31.7100	1.1450	36.3092		(27)
Ground Floor			79.0100	0.1200	9.4812	84.0000	6636.8400 (28a)
Brick and Block	204.9800	33.8300	171.1500	0.2400	41.0760	42.2200	7225.9530 (29a)
Pitched Roof	79.0100		79.0100	0.1000	7.9010	9.1000	718.9910 (30)
Total net area of external elements Aum(A, m ²)			363.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	97.0994		(33)
GF Block			76.6500			75.0000	5748.7500 (32c)
GF Stud			27.8600			9.0000	250.7400 (32c)
FF Stud			170.6200			9.0000	1535.5800 (32c)
Internal Floor 1			79.0100			18.0000	1422.1800 (32d)
Internal Ceiling 1			79.0100			18.0000	1422.1800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24961.2140 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.9624 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1517 (36)
Total fabric heat loss (33) + (36) = 103.2510 (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	73.9769	73.6658	73.3609	71.9286	71.6607	70.4132	70.4132	70.1822	70.8937	71.6607	72.2028	72.7695 (38)
Heat transfer coeff	177.2280	176.9169	176.6119	175.1796	174.9117	173.6642	173.6642	173.4332	174.1447	174.9117	175.4538	176.0205 (39)
Average = Sum(39)m / 12 =												175.1784 (39)
HLP	1.1216	1.1196	1.1177	1.1086	1.1069	1.0990	1.0990	1.0975	1.1020	1.1069	1.1103	1.1139 (40)
HLP (average)												1.1086 (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												2.9461 (42)
Average daily hot water use (litres/day)												104.1700 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5870	110.4202	106.2534	102.0866	97.9198	93.7530	93.7530	97.9198	102.0866	106.2534	110.4202	114.5870 (44)
Energy conte	169.9292	148.6212	153.3637	133.7062	128.2943	110.7082	102.5874	117.7206	119.1265	138.8305	151.5443	164.5673 (45)
Energy content (annual)										Total = Sum(45)m =		1638.9995 (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	25.4894	22.2932	23.0046	20.0559	19.2441	16.6062	15.3881	17.6581	17.8690	20.8246	22.7317	24.6851 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
222.1518 195.7900 205.5863 184.2442 180.5169 161.2462 154.8100 169.9432 169.6645 191.0531 202.0823 216.7899 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	222.1518	195.7900	205.5863	184.2442	180.5169	161.2462	154.8100	169.9432	169.6645	191.0531	202.0823	216.7899 (64)
Heat gains from water heating, kWh/month	98.2795	87.1516	92.7715	84.8877	84.4359	77.2409	75.8884	80.9202	80.0400	87.9392	90.8189	96.4967 (65)
Total per year (kWh/year) = Sum(64)m =												2253.8785 (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	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.5376	26.2350	21.3358	16.1525	12.0742	10.1936	11.0145	14.3171	19.2163	24.3996	28.4779	30.3585 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	329.1182	332.5334	323.9272	305.6055	282.4777	260.7409	246.2193	242.8041	251.4103	269.7320	292.8598	314.5967 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305 (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)	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442 (71)
Water heating gains (Table 5)	132.0962	129.6898	124.6929	117.8996	113.4892	107.2790	102.0005	108.7637	111.1666	118.1979	126.1374	129.6999 (72)
Total internal gains	560.9435	558.6499	540.1474	509.8493	478.2327	448.4050	429.4259	436.0764	451.9849	482.5210	517.6666	544.8467 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	2.1700	10.6334	0.6300	0.7000	0.7700	7.0519 (74)
East	9.5400	19.6403	0.6300	0.7000	0.7700	57.2621 (76)
South	3.1600	46.7521	0.6300	0.7000	0.7700	45.1502 (78)
West	16.8400	19.6403	0.6300	0.7000	0.7700	101.0791 (80)

Solar gains	210.5433	397.1698	627.2043	887.2090	1072.2467	1093.1549	1042.4225	903.8749	719.2096	463.3412	259.6506	175.1048 (83)
Total gains	771.4868	955.8197	1167.3517	1397.0582	1550.4794	1541.5599	1471.8484	1339.9513	1171.1944	945.8622	777.3172	719.9515 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	39.1229	39.1917	39.2594	39.5803	39.6410	39.9257	39.9257	39.9789	39.8156	39.6410	39.5185	39.3913
alpha	3.6082	3.6128	3.6173	3.6387	3.6427	3.6617	3.6617	3.6653	3.6544	3.6427	3.6346	3.6261
util living area	0.9942	0.9871	0.9674	0.9126	0.8030	0.6434	0.4954	0.5559	0.7951	0.9534	0.9893	0.9955 (86)
MIT	19.1483	19.3905	19.7898	20.2842	20.6765	20.8984	20.9703	20.9550	20.7705	20.2224	19.5857	19.1042 (87)
Th 2	19.9833	19.9849	19.9864	19.9938	19.9952	20.0016	20.0016	20.0028	19.9992	19.9952	19.9924	19.9895 (88)
util rest of house	0.9929	0.9841	0.9599	0.8921	0.7579	0.5656	0.3927	0.4507	0.7310	0.9385	0.9864	0.9945 (89)
MIT 2	17.4928	17.8463	18.4247	19.1287	19.6527	19.9194	19.9859	19.9768	19.7864	19.0571	18.1375	17.4324 (90)
Living area fraction									fLA = Living area / (4) =			0.1788 (91)
MIT	17.7888	18.1224	18.6688	19.3352	19.8357	20.0944	20.1619	20.1516	19.9623	19.2654	18.3964	17.7313 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7888	18.1224	18.6688	19.3352	19.8357	20.0944	20.1619	20.1516	19.9623	19.2654	18.3964	17.7313 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9885	0.9763	0.9466	0.8756	0.7498	0.5734	0.4099	0.4673	0.7283	0.9240	0.9795	0.9909 (94)
Ext temp.	762.6109	933.1728	1104.9950	1223.3238	1162.4992	883.9057	603.3011	626.1163	852.9728	873.9847	761.3730	713.3659 (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	2390.5907	2339.2668	2149.1489	1828.0412	1423.0288	954.1862	618.5688	650.6601	1020.8917	1515.6787	1982.0044	2381.7825 (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 per m2	1211.2170	944.8952	776.8505	435.3965	193.8340	0.0000	0.0000	0.0000	0.0000	477.4203	878.8547	1241.3020 (98)
												6159.7702 (98)
												(98) / (4) = 38.9810 (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 %)														90.5000 (206)
Efficiency of secondary/supplementary heating system, %														0.0000 (208)
Space heating requirement														6806.3759 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	1211.2170	944.8952	776.8505	435.3965	193.8340	0.0000	0.0000	0.0000	0.0000	477.4203	878.8547	1241.3020	(98)	
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)	
Space heating fuel (main heating system)	1338.3613	1044.0831	858.3984	481.1011	214.1812	0.0000	0.0000	0.0000	0.0000	527.5363	971.1101	1371.6044	(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	222.1518	195.7900	205.5863	184.2442	180.5169	161.2462	154.8100	169.9432	169.6645	191.0531	202.0823	216.7899	(64)	
Efficiency of water heater (217)m	88.6576	88.4640	88.0300	87.0302	85.0039	79.8000	79.8000	79.8000	79.8000	87.1598	88.2869	88.7311	(216)	
Fuel for water heating, kWh/month	250.5728	221.3216	233.5413	211.7015	212.3632	202.0629	193.9975	212.9614	212.6122	219.1985	228.8928	244.3225	(219)	
Water heating fuel used												2643.5482	(219)	
Annual totals kWh/year														
Space heating fuel - main system													6806.3759	(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)													521.6432	(232)
Energy saving/generation technologies (Appendices M,N and Q)														
PV Unit 0 (0.80 + 0.97 * 1068 * 1.00) =										-828.8227			-828.8227	(233)
Total delivered energy for all uses													9217.7446	(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	6806.3759	0.2160	1470.1772	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2643.5482	0.2160	571.0064	(264)
Space and water heating			2041.1836	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	521.6432	0.5190	270.7328	(268)
Energy saving/generation technologies				
PV Unit	-828.8227	0.5190	-430.1590	(269)
Total CO2, kg/year			1920.6825	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.1500	(273)

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

DER		12.1500	ZC1
Total Floor Area		158.0200	
Assumed number of occupants		2.9461	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		12.3420	ZC2
CO2 emissions from cooking, equation (L16)		1.2005	ZC3
Total CO2 emissions		25.6925	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		25.6925	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	79.0100 (1b)	x 2.3900 (2b)	= 188.8339 (1b) - (3b)
First floor	79.0100 (1c)	x 2.6700 (2c)	= 210.9567 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 399.7906 (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) =	0.1001 (8)	
Pressure test															Yes		
Measured/design AP50															5.0000		
Infiltration rate															0.3501 (18)		
Number of sides sheltered															2 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.2975 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)					
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)					
Adj infilt rate	0.3794	0.3719	0.3645	0.3273	0.3199	0.2827	0.2827	0.2752	0.2975	0.3199	0.3347	0.3496 (22b)					
Effective ac	0.5720	0.5692	0.5664	0.5536	0.5512	0.5400	0.5400	0.5379	0.5443	0.5512	0.5560	0.5611 (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)			31.7100	1.3258	42.0398		(27)					
Ground Floor			79.0100	0.1300	10.2713		(28a)					
Brick and Block	204.9800	33.8300	171.1500	0.1800	30.8070		(29a)					
Pitched Roof	79.0100		79.0100	0.1300	10.2713		(30)					
Total net area of external elements Aum(A, m2)			363.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.5094		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.5067 (36)					
Total fabric heat loss						(33) + (36) =	111.0161 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 75.4593	Feb 75.0906	Mar 74.7293	Apr 73.0320	May 72.7144	Jun 71.2361	Jul 71.2361	Aug 70.9624	Sep 71.8056	Oct 72.7144	Nov 73.3568	Dec 74.0284 (38)
Heat transfer coeff	186.4753	186.1067	185.7453	184.0480	183.7305	182.2522	182.2522	181.9785	182.8216	183.7305	184.3729	185.0445 (39)
Average = Sum(39)m / 12 =												184.0465 (39)
HLP	Jan 1.1801	Feb 1.1777	Mar 1.1755	Apr 1.1647	May 1.1627	Jun 1.1533	Jul 1.1533	Aug 1.1516	Sep 1.1570	Oct 1.1627	Nov 1.1668	Dec 1.1710 (40)
HLP (average)												1.1647 (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												2.9461 (42)
Average daily hot water use (litres/day)												104.1700 (43)
Daily hot water use	Jan 114.5870	Feb 110.4202	Mar 106.2534	Apr 102.0866	May 97.9198	Jun 93.7530	Jul 93.7530	Aug 97.9198	Sep 102.0866	Oct 106.2534	Nov 110.4202	Dec 114.5870 (44)
Energy conte	169.9292	148.6212	153.3637	133.7062	128.2943	110.7082	102.5874	117.7206	119.1265	138.8305	151.5443	164.5673 (45)
Energy content (annual)										Total = Sum(45)m =		1638.9995 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.4894	22.2932	23.0046	20.0559	19.2441	16.6062	15.3881	17.6581	17.8690	20.8246	22.7317	24.6851 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7258 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)	0.9319 (55)											
Total storage loss												
	28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896 (56)
If cylinder contains dedicated solar storage												
	28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	222.0811	195.7261	205.5157	184.1758	180.4462	161.1778	154.7394	169.8725	169.5962	190.9824	202.0140	216.7193 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
	Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h												
	222.0811	195.7261	205.5157	184.1758	180.4462	161.1778	154.7394	169.8725	169.5962	190.9824	202.0140	216.7193 (64)
	Total per year (kWh/year) = Sum(64)m =											2253.0467 (64)
Heat gains from water heating, kWh/month												
	98.2230	87.1005	92.7150	84.8330	84.3794	77.1862	75.8319	80.8637	79.9853	87.8827	90.7642	96.4402 (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	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.5376	26.2350	21.3358	16.1525	12.0742	10.1936	11.0145	14.3171	19.2163	24.3996	28.4779	30.3585	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	329.1182	332.5334	323.9272	305.6055	282.4777	260.7409	246.2193	242.8041	251.4103	269.7320	292.8598	314.5967	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	(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)	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	(71)
Water heating gains (Table 5)	132.0202	129.6139	124.6169	117.8236	113.4132	107.2030	101.9246	108.6877	111.0907	118.1219	126.0614	129.6239	(72)
Total internal gains	560.8676	558.5739	540.0715	509.7733	478.1567	448.3290	429.3499	436.0004	451.9089	482.4450	517.5906	544.7707	(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				2.1700	10.6334	0.6300	0.7000	0.7700	7.0519 (74)				
East				9.5400	19.6403	0.6300	0.7000	0.7700	57.2621 (76)				
South				3.1600	46.7521	0.6300	0.7000	0.7700	45.1502 (78)				
West				16.8400	19.6403	0.6300	0.7000	0.7700	101.0791 (80)				
Solar gains	210.5433	397.1698	627.2043	887.2090	1072.2467	1093.1549	1042.4225	903.8749	719.2096	463.3412	259.6506	175.1048	(83)
Total gains	771.4108	955.7437	1167.2758	1396.9823	1550.4034	1541.4839	1471.7724	1339.8753	1171.1185	945.7862	777.2412	719.8755	(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	58.8475	58.9641	59.0788	59.6236	59.7267	60.2111	60.2111	60.3017	60.0236	59.7267	59.5186	59.3025
alpha	4.9232	4.9309	4.9386	4.9749	4.9818	5.0141	5.0141	5.0201	5.0016	4.9818	4.9679	4.9535
util living area	0.9992	0.9976	0.9908	0.9610	0.8706	0.7007	0.5327	0.6013	0.8627	0.9846	0.9981	0.9995 (86)
MIT	19.6149	19.7919	20.0909	20.4757	20.7871	20.9488	20.9894	20.9813	20.8510	20.4191	19.9412	19.5854 (87)
Th 2	19.9360	19.9378	19.9397	19.9483	19.9500	19.9575	19.9575	19.9589	19.9546	19.9500	19.9467	19.9433 (88)
util rest of house	0.9989	0.9967	0.9874	0.9459	0.8233	0.6083	0.4128	0.4768	0.7938	0.9764	0.9973	0.9993 (89)
MIT 2	18.0788	18.3390	18.7753	19.3302	19.7421	19.9238	19.9537	19.9512	19.8322	19.2600	18.5639	18.0408 (90)
Living area fraction	18.3535	18.5987	19.0105	19.5350	19.9289	20.1070	20.1388	20.1354	20.0144	19.4672	18.8101	18.3170 (91)
MIT	18.3535	18.5987	19.0105	19.5350	19.9289	20.1070	20.1388	20.1354	20.0144	19.4672	18.8101	18.3170 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3535	18.5987	19.0105	19.5350	19.9289	20.1070	20.1388	20.1354	20.0144	19.4672	18.8101	18.3170 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9983	0.9950	0.9831	0.9383	0.8222	0.6225	0.4343	0.4989	0.7984	0.9709	0.9960	0.9988	(94)
Useful gains	770.0883	950.9957	1147.5638	1310.8010	1274.7142	959.6007	639.1310	668.4666	935.0718	918.3046	774.1263	718.9951	(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	2620.6222	2549.4241	2323.7699	1957.3477	1511.9018	1003.6684	644.9596	679.7595	1081.2724	1629.1783	2159.0250	2612.2645	(97)
Month fracti	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 kWh	1376.7972	1074.1439	875.0974	465.5136	176.4676	0.0000	0.0000	0.0000	0.0000	528.8900	997.1270	1408.5924	(98)
Space heating												6902.6291	(98)
Space heating per m ²												43.6820	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7382.4911 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1376.7972	1074.1439	875.0974	465.5136	176.4676	0.0000	0.0000	0.0000	0.0000	528.8900	997.1270	1408.5924	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1472.5104	1148.8170	935.9330	497.8755	188.7354	0.0000	0.0000	0.0000	0.0000	565.6578	1066.4460	1506.5160	(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	222.0811	195.7261	205.5157	184.1758	180.4462	161.1778	154.7394	169.8725	169.5962	190.9824	202.0140	216.7193	(64)
Efficiency of water heater (217)m	88.8453	88.6675	88.2496	87.1860	84.7545	79.8000	79.8000	79.8000	79.8000	87.3912	88.5009	88.9104	(216)
Fuel for water heating, kWh/month	249.9638	220.7416	232.8801	211.2448	212.9046	201.9773	193.9090	212.8729	212.5265	218.5373	228.2621	243.7503	(219)
Water heating fuel used												2639.5702	(219)
Annual totals kWh/year													
Space heating fuel - main system												7382.4911	(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)												521.6432	(232)
Total delivered energy for all uses												10618.7045	(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	7382.4911	0.2160	1594.6181 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2639.5702	0.2160	570.1472 (264)
Space and water heating			2164.7652 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	521.6432	0.5190	270.7328 (268)
Total CO2, kg/m2/year			2474.4231 (272)
Emissions per m2 for space and water heating			13.6993 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.7133 (272b)
Emissions per m2 for pumps and fans			0.2463 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.6993 * 1.00) + 1.7133 + 0.2463, rounded to 2 d.p.			15.6600 (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	79.0100 (1b)	x 2.3900 (2b)	= 188.8339 (1b) - (3b)
First floor	79.0100 (1c)	x 2.6700 (2c)	= 210.9567 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 399.7906 (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) = 0.1001 (8)
Pressure test					Yes
Measured/design AP50					3.9300
Infiltration rate					0.2966 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2521 (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	0.3214	0.3151	0.3088	0.2773	0.2710	0.2395	0.2395	0.2332	0.2521	0.2710	0.2836	0.2962 (22b)
Effective ac	0.5516	0.5496	0.5477	0.5384	0.5367	0.5287	0.5287	0.5272	0.5318	0.5367	0.5402	0.5439 (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)			31.7100	1.1450	36.3092		(27)
Ground Floor			79.0100	0.1200	9.4812	84.0000	6636.8400 (28a)
Brick and Block	204.9800	33.8300	171.1500	0.2400	41.0760	42.2200	7225.9530 (29a)
Pitched Roof	79.0100		79.0100	0.1000	7.9010	9.1000	718.9910 (30)
Total net area of external elements Aum(A, m ²)			363.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	97.0994		(33)
GF Block			76.6500			75.0000	5748.7500 (32c)
GF Stud			27.8600			9.0000	250.7400 (32c)
FF Stud			170.6200			9.0000	1535.5800 (32c)
Internal Floor 1			79.0100			18.0000	1422.1800 (32d)
Internal Ceiling 1			79.0100			9.0000	711.0900 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24250.1240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 153.4624 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1517 (36)
Total fabric heat loss (33) + (36) = 103.2510 (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	72.7791	72.5145	72.2551	71.0370	70.8091	69.7482	69.7482	69.5517	70.1568	70.8091	71.2702	71.7522 (38)
Heat transfer coeff	176.0301	175.7655	175.5062	174.2880	174.0601	172.9992	172.9992	172.8027	173.4078	174.0601	174.5212	175.0032 (39)
Average = Sum(39)m / 12 =												174.2869 (39)
HLP	1.1140	1.1123	1.1107	1.1029	1.1015	1.0948	1.0948	1.0935	1.0974	1.1015	1.1044	1.1075 (40)
HLP (average)												1.1029 (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												2.9461 (42)
Average daily hot water use (litres/day)												104.1700 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5870	110.4202	106.2534	102.0866	97.9198	93.7530	93.7530	97.9198	102.0866	106.2534	110.4202	114.5870 (44)
Energy conte	169.9292	148.6212	153.3637	133.7062	128.2943	110.7082	102.5874	117.7206	119.1265	138.8305	151.5443	164.5673 (45)
Energy content (annual)										Total = Sum(45)m =		1638.9995 (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	36.1100	31.5820	32.5898	28.4126	27.2625	23.5255	21.7998	25.0156	25.3144	29.5015	32.2032	34.9706 (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	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.5376	26.2350	21.3358	16.1525	12.0742	10.1936	11.0145	14.3171	19.2163	24.3996	28.4779	30.3585	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	329.1182	332.5334	323.9272	305.6055	282.4777	260.7409	246.2193	242.8041	251.4103	269.7320	292.8598	314.5967	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	(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)	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	(71)
Water heating gains (Table 5)	48.5349	46.9970	43.8035	39.4619	36.6432	32.6743	29.3008	33.6232	35.1589	39.6525	44.7266	47.0034	(72)
Total internal gains	474.3823	472.9571	456.2580	428.4116	398.3867	370.8003	353.7262	357.9359	372.9771	400.9756	433.2559	459.1502	(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					2.1700	10.6334		0.6300	0.7000	0.7700		7.0519 (74)
East					9.5400	19.6403		0.6300	0.7000	0.7700		57.2621 (76)
South					3.1600	46.7521		0.6300	0.7000	0.7700		45.1502 (78)
West					16.8400	19.6403		0.6300	0.7000	0.7700		101.0791 (80)
Solar gains	210.5433	397.1698	627.2043	887.2090	1072.2467	1093.1549	1042.4225	903.8749	719.2096	463.3412	259.6506	175.1048 (83)
Total gains	684.9255	870.1269	1083.4623	1315.6205	1470.6334	1463.9552	1396.1487	1261.8108	1092.1867	864.3168	692.9065	634.2550 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.2670	38.3246	38.3813	38.6495	38.7001	38.9374	38.9374	38.9817	38.8457	38.7001	38.5979	38.4916	
alpha	3.5511	3.5550	3.5588	3.5766	3.5800	3.5958	3.5958	3.5988	3.5897	3.5800	3.5732	3.5661	
util living area	0.9956	0.9895	0.9719	0.9214	0.8175	0.6629	0.5154	0.5798	0.8163	0.9617	0.9919	0.9967	(86)
MIT	19.0501	19.2989	19.7105	20.2233	20.6391	20.8813	20.9638	20.9450	20.7355	20.1517	19.4947	19.0034	(87)
Th 2	19.9894	19.9908	19.9921	19.9984	19.9996	20.0051	20.0051	20.0061	20.0030	19.9996	19.9972	19.9947	(88)
util rest of house	0.9947	0.9871	0.9655	0.9028	0.7746	0.5860	0.4108	0.4733	0.7561	0.9492	0.9897	0.9959	(89)
MIT 2	18.1926	18.4412	18.8495	19.3517	19.7350	19.9380	19.9916	19.9836	19.8314	19.2928	18.6421	18.1499	(90)
Living area fraction									fLA = Living area / (4) =			0.1788	(91)
MIT	18.3459	18.5945	19.0034	19.5075	19.8966	20.1067	20.1654	20.1555	19.9930	19.4464	18.7945	18.3025	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3459	18.5945	19.0034	19.5075	19.8966	20.1067	20.1654	20.1555	19.9930	19.4464	18.7945	18.3025	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	679.7220	855.0591	1037.0998	1173.2449	1131.8804	870.2314	598.1217	618.7420	825.0322	812.6775	683.1952	630.5409	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2472.5027	2407.0230	2194.4244	1848.7654	1426.7003	952.6510	616.8069	648.9575	1021.8922	1539.8014	2040.9462	2467.9797	(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	1333.8288	1042.9197	861.0496	486.3748	219.3460	0.0000	0.0000	0.0000	0.0000	540.9802	977.5807	1367.0545	(98)
Space heating												6829.1342	(98)
Space heating per m2												(98) / (4) =	43.2169 (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	1626.1923	1280.1939	1313.3006	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8279	0.8867	0.8530	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1346.2847	1135.0841	1120.2532	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1839.5820	1757.2893	1602.8320	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	355.1741	462.9207	359.0386	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												1177.1333 (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	88.7935	115.7302	89.7597	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												294.2833 (107)
Space cooling per m2												1.8623 (108)
Energy for space heating												43.2169 (99)
Energy for space cooling												1.8623 (108)
Total												45.0792 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.1 (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	79.0100 (1b)	x 2.3900 (2b)	= 188.8339 (1b) - (3b)
First floor	79.0100 (1c)	x 2.6700 (2c)	= 210.9567 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	399.7906 (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					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) = 0.1001 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3501 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2975 (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	0.3794	0.3719	0.3645	0.3273	0.3199	0.2827	0.2827	0.2752	0.2975	0.3199	0.3347	0.3496 (22b)
Effective ac	0.5720	0.5692	0.5664	0.5536	0.5512	0.5400	0.5400	0.5379	0.5443	0.5512	0.5560	0.5611 (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)			31.7100	1.3258	42.0398		(27)
Ground Floor			79.0100	0.1300	10.2713		(28a)
Brick and Block	204.9800	33.8300	171.1500	0.1800	30.8070		(29a)
Pitched Roof	79.0100		79.0100	0.1300	10.2713		(30)
Total net area of external elements Aum(A, m ²)			363.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	95.5094		(33)

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

250.0000 (35)
15.5067 (36)
(33) + (36) = 111.0161 (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	75.4593	75.0906	74.7293	73.0320	72.7144	71.2361	71.2361	70.9624	71.8056	72.7144	73.3568	74.0284 (38)
Heat transfer coeff	186.4753	186.1067	185.7453	184.0480	183.7305	182.2522	182.2522	181.9785	182.8216	183.7305	184.3729	185.0445 (39)
Average = Sum(39)m / 12 =												184.0465 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1801	1.1777	1.1755	1.1647	1.1627	1.1533	1.1533	1.1516	1.1570	1.1627	1.1668	1.1710 (40)
HLP (average)												1.1647 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

2.9461 (42)
104.1700 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.5870	110.4202	106.2534	102.0866	97.9198	93.7530	93.7530	97.9198	102.0866	106.2534	110.4202	114.5870 (44)
Energy conte	169.9292	148.6212	153.3637	133.7062	128.2943	110.7082	102.5874	117.7206	119.1265	138.8305	151.5443	164.5673 (45)
Energy content (annual)										Total = Sum(45)m =		1638.9995 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	36.1100	31.5820	32.5898	28.4126	27.2625	23.5255	21.7998	25.0156	25.3144	29.5015	32.2032	34.9706 (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	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052	147.3052 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.5376	26.2350	21.3358	16.1525	12.0742	10.1936	11.0145	14.3171	19.2163	24.3996	28.4779	30.3585 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	329.1182	332.5334	323.9272	305.6055	282.4777	260.7409	246.2193	242.8041	251.4103	269.7320	292.8598	314.5967 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305	37.7305 (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)	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442 (71)
Water heating gains (Table 5)	48.5349	46.9970	43.8035	39.4619	36.6432	32.6743	29.3008	33.6232	35.1589	39.6525	44.7266	47.0034 (72)
Total internal gains	474.3823	472.9571	456.2580	428.4116	398.3867	370.8003	353.7262	357.9359	372.9771	400.9756	433.2559	459.1502 (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	2.1700	10.6334	0.6300	0.7000	0.7700	7.0519 (74)
East	9.5400	19.6403	0.6300	0.7000	0.7700	57.2621 (76)
South	3.1600	46.7521	0.6300	0.7000	0.7700	45.1502 (78)
West	16.8400	19.6403	0.6300	0.7000	0.7700	101.0791 (80)

Solar gains	210.5433	397.1698	627.2043	887.2090	1072.2467	1093.1549	1042.4225	903.8749	719.2096	463.3412	259.6506	175.1048 (83)
Total gains	684.9255	870.1269	1083.4623	1315.6205	1470.6334	1463.9552	1396.1487	1261.8108	1092.1867	864.3168	692.9065	634.2550 (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	58.8475	58.9641	59.0788	59.6236	59.7267	60.2111	60.2111	60.3017	60.0236	59.7267	59.5186	59.3025
alpha	4.9232	4.9309	4.9386	4.9749	4.9818	5.0141	5.0141	5.0201	5.0016	4.9818	4.9679	4.9535
util living area	0.9995	0.9984	0.9933	0.9688	0.8886	0.7272	0.5586	0.6323	0.8872	0.9894	0.9989	0.9997 (86)
MIT	19.5639	19.7419	20.0433	20.4355	20.7617	20.9395	20.9870	20.9767	20.8264	20.3740	19.8916	19.5348 (87)
Th 2	19.9360	19.9378	19.9397	19.9483	19.9500	19.9575	19.9575	19.9589	19.9546	19.9500	19.9467	19.9433 (88)
util rest of house	0.9994	0.9978	0.9908	0.9563	0.8452	0.6350	0.4343	0.5043	0.8248	0.9835	0.9984	0.9996 (89)
MIT 2	18.6171	18.7963	19.0979	19.4888	19.7882	19.9297	19.9542	19.9522	19.8540	19.4354	18.9532	18.5938 (90)
Living area fraction	18.7864	18.9654	19.2669	19.6580	19.9622	20.1102	20.1388	20.1354	fLA = Living area / (4) =			0.1788 (91)
MIT	18.7864	18.9654	19.2669	19.6580	19.9622	20.1102	20.1388	20.1354	20.0278	19.6032	19.1209	18.7620 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7864	18.9654	19.2669	19.6580	19.9622	20.1102	20.1388	20.1354	20.0278	19.6032	19.1209	18.7620 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9991	0.9971	0.9885	0.9519	0.8457	0.6497	0.4567	0.5273	0.8301	0.9808	0.9979	0.9994 (94)
Ext temp.	684.3300	867.5794	1071.0513	1252.3544	1243.7858	951.0937	637.6703	665.3551	906.6512	847.7100	691.4284	633.8802 (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	2701.3535	2617.6572	2371.3981	1979.9940	1518.0198	1004.2546	644.9622	679.7536	1083.7388	1654.1601	2216.3338	2694.6271 (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	1500.6654	1176.0523	967.4580	523.9005	204.0301	0.0000	0.0000	0.0000	0.0000	599.9989	1097.9318	1533.1957 (98)
Space heating per m2										(98) / (4) =		48.1156 (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	1713.1708	1348.6664	1383.0363	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8619	0.9225	0.8889	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1476.6347	1244.2102	1229.3382	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1839.5820	1757.2893	1602.8320	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	261.3221	381.7308	277.8794	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												920.9323 (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	65.3305	95.4327	69.4698	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												230.2331 (107)
Space cooling per m2												1.4570 (108)
Energy for space heating												48.1156 (99)
Energy for space cooling												1.4570 (108)
Total												49.5726 (109)
Target Fabric Energy Efficiency (TFEE)												57.0 (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	79.0100 (1b)	x 2.3900 (2b)	= 188.8339 (1b) - (3b)
First floor	79.0100 (1c)	x 2.6700 (2c)	= 210.9567 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 399.7906 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1251 (8)
Pressure test					Yes
Measured/design AP50					3.9300
Infiltration rate					0.3216 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2733 (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	0.3212	0.3007	0.3007	0.2733	0.2802	0.2665	0.2665	0.2597	0.2597	0.2802	0.2733	0.2802 (22b)
Effective ac	0.5516	0.5452	0.5452	0.5374	0.5392	0.5355	0.5355	0.5337	0.5337	0.5392	0.5374	0.5392 (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)			31.7100	1.1450	36.3092		(27)
Ground Floor			79.0100	0.1200	9.4812	84.0000	6636.8400 (28a)
Brick and Block	204.9800	33.8300	171.1500	0.2400	41.0760	42.2200	7225.9530 (29a)
Pitched Roof	79.0100		79.0100	0.1000	7.9010	9.1000	718.9910 (30)
Total net area of external elements Aum(A, m ²)			363.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	97.0994		(33)
GF Block			76.6500			75.0000	5748.7500 (32c)
GF Stud			27.8600			9.0000	250.7400 (32c)
FF Stud			170.6200			9.0000	1535.5800 (32c)
Internal Floor 1			79.0100			18.0000	1422.1800 (32d)
Internal Ceiling 1			79.0100			18.0000	1422.1800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	24961.2140 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.9624 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.1517 (36)
Total fabric heat loss						(33) + (36) =	103.2510 (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	72.7695	71.9286	71.9286	70.8937	71.1432	70.6504	70.6504	70.4132	70.4132	71.1432	70.8937	71.1432 (38)
Average = Sum(39)m / 12 =	176.0205	175.1796	175.1796	174.1447	174.3942	173.9014	173.9014	173.6642	173.6642	174.3942	174.1447	174.3942 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1139	1.1086	1.1086	1.1020	1.1036	1.1005	1.1005	1.0990	1.0990	1.1036	1.1020	1.1036 (40)
HLP (average)												1.1038 (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												2.9461 (42)
Average daily hot water use (litres/day)												104.1700 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.5870	110.4202	106.2534	102.0866	97.9198	93.7530	93.7530	97.9198	102.0866	106.2534	110.4202	114.5870 (44)
Energy conte	169.9292	148.6212	153.3637	133.7062	128.2943	110.7082	102.5874	117.7206	119.1265	138.8305	151.5443	164.5673 (45)
Energy content (annual)										Total = Sum(45)m =		1638.9995 (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	25.4894	22.2932	23.0046	20.0559	19.2441	16.6062	15.3881	17.6581	17.8690	20.8246	22.7317	24.6851 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
222.1518 195.7900 205.5863 184.2442 180.5169 161.2462 154.8100 169.9432 169.6645 191.0531 202.0823 216.7899 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	222.1518	195.7900	205.5863	184.2442	180.5169	161.2462	154.8100	169.9432	169.6645	191.0531	202.0823	216.7899 (64)
RHI water heating demand												2254 (64)
Heat gains from water heating, kWh/month	98.2795	87.1516	92.7715	84.8877	84.4359	77.2409	75.8884	80.9202	80.0400	87.9392	90.8189	96.4967 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.8440	65.5876	53.3394	40.3814	30.1855	25.4839	27.5363	35.7927	48.0408	60.9989	71.1947	75.8963 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	491.2212	496.3186	483.4734	456.1277	421.6086	389.1655	367.4915	362.3941	375.2393	402.5850	437.1041	469.5472 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227 (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)	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442 (71)
Water heating gains (Table 5)	132.0962	129.6898	124.6929	117.8996	113.4892	107.2790	102.0005	108.7637	111.1666	118.1979	126.1374	129.6999 (72)
Total internal gains	814.7062	809.1408	779.0506	731.9535	682.8281	639.4732	614.5731	624.4953	651.9916	699.3266	751.9810	792.6883 (73)

6. Solar gains

[Jan]				Area	Solar flux		g		FF		Access		Gains	
				m2	Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
North				2.1700	13.4684		0.6300		0.7000		0.7700		8.9320 (74)	
East				9.5400	25.1733		0.6300		0.7000		0.7700		73.3938 (76)	
South				3.1600	56.5862		0.6300		0.7000		0.7700		54.6474 (78)	
West				16.8400	25.1733		0.6300		0.7000		0.7700		129.5547 (80)	
Solar gains	266.5280	428.3263	688.3678	975.5936	1107.5153	1248.4645	1144.1951	1036.6367	825.7442	539.2366	327.7389	209.7484	(83)	
Total gains	1081.2342	1237.4671	1467.4184	1707.5470	1790.3434	1887.9377	1758.7682	1661.1320	1477.7358	1238.5632	1079.7199	1002.4368	(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	39.3913	39.5803	39.5803	39.8156	39.7586	39.8713	39.8713	39.9257	39.9257	39.7586	39.8156	39.7586
alpha	3.6261	3.6387	3.6387	3.6544	3.6506	3.6581	3.6581	3.6617	3.6617	3.6506	3.6544	3.6506
util living area	0.9782	0.9648	0.9235	0.8246	0.6728	0.4536	0.3226	0.3305	0.6014	0.8636	0.9586	0.9823 (86)
MIT	19.6013	19.7851	20.1593	20.5840	20.8530	20.9741	20.9945	20.9943	20.9288	20.5907	20.0457	19.5717 (87)
Th 2	19.9895	19.9938	19.9938	19.9992	19.9979	20.0004	20.0004	20.0016	20.0016	19.9979	19.9992	19.9979 (88)
util rest of house	0.9733	0.9570	0.9070	0.7889	0.6106	0.3710	0.2267	0.2294	0.5131	0.8246	0.9477	0.9782 (89)
MIT 2	18.1547	18.4213	18.9510	19.5307	19.8616	19.9846	19.9987	20.0000	19.9507	19.5554	18.8034	18.1179 (90)
Living area fraction									fLA = Living area / (4) =			0.1788 (91)
MIT	18.4133	18.6651	19.1670	19.7190	20.0388	20.1615	20.1767	20.1777	20.1255	19.7405	19.0255	18.3778 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4133	18.6651	19.1670	19.7190	20.0388	20.1615	20.1767	20.1777	20.1255	19.7405	19.0255	18.3778 (93)

8. Space heating requirement

Utilisation	0.9626	0.9434	0.8902	0.7776	0.6134	0.3846	0.2438	0.2474	0.5247	0.8127	0.9334	0.9688 (94)
Useful gains	1040.7467	1167.3965	1306.2657	1327.7082	1098.1205	726.1711	428.8131	411.0239	775.3902	1006.5600	1007.8084	971.1187 (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	2255.4099	2218.6656	2026.3111	1675.0971	1210.0886	741.0769	430.7082	412.9240	820.6578	1332.4587	1815.5425	2210.9382 (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	903.7095	706.4529	535.7137	250.1200	83.3042	0.0000	0.0000	0.0000	0.0000	242.4686	581.5685	922.4257 (98)
Space heating												4225.7632 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

RHI space heating demand

4226 (98)

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	79.0100 (1b)	x 2.3900 (2b)	= 188.8339 (1b) - (3b)
First floor	79.0100 (1c)	x 2.6700 (2c)	= 210.9567 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 399.7906 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1251 (8)
Pressure test					Yes
Measured/design AP50					3.9300
Infiltration rate					0.3216 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2733 (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	0.3485	0.3417	0.3348	0.3007	0.2938	0.2597	0.2597	0.2528	0.2733	0.2938	0.3075	0.3212 (22b)
Effective ac	0.5607	0.5584	0.5561	0.5452	0.5432	0.5337	0.5337	0.5320	0.5374	0.5432	0.5473	0.5516 (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)			31.7100	1.1450	36.3092		(27)
Ground Floor			79.0100	0.1200	9.4812	84.0000	6636.8400 (28a)
Brick and Block	204.9800	33.8300	171.1500	0.2400	41.0760	42.2200	7225.9530 (29a)
Pitched Roof	79.0100		79.0100	0.1000	7.9010	9.1000	718.9910 (30)
Total net area of external elements Aum(A, m ²)			363.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	97.0994		(33)
GF Block			76.6500			75.0000	5748.7500 (32c)
GF Stud			27.8600			9.0000	250.7400 (32c)
FF Stud			170.6200			9.0000	1535.5800 (32c)
Internal Floor 1			79.0100			18.0000	1422.1800 (32d)
Internal Ceiling 1			79.0100			18.0000	1422.1800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24961.2140 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.9624 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1517 (36)
Total fabric heat loss (33) + (36) = 103.2510 (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	73.9769	73.6658	73.3609	71.9286	71.6607	70.4132	70.4132	70.1822	70.8937	71.6607	72.2028	72.7695 (38)
Heat transfer coeff	177.2280	176.9169	176.6119	175.1796	174.9117	173.6642	173.6642	173.4332	174.1447	174.9117	175.4538	176.0205 (39)
Average = Sum(39)m / 12 =												175.1784 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1216	1.1196	1.1177	1.1086	1.1069	1.0990	1.0990	1.0975	1.1020	1.1069	1.1103	1.1139 (40)
HLP (average)												1.1086 (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												2.9461 (42)
Average daily hot water use (litres/day)												104.1700 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.5870	110.4202	106.2534	102.0866	97.9198	93.7530	93.7530	97.9198	102.0866	106.2534	110.4202	114.5870 (44)
Energy conte	169.9292	148.6212	153.3637	133.7062	128.2943	110.7082	102.5874	117.7206	119.1265	138.8305	151.5443	164.5673 (45)
Energy content (annual)										Total = Sum(45)m =		1638.9995 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.4894	22.2932	23.0046	20.0559	19.2441	16.6062	15.3881	17.6581	17.8690	20.8246	22.7317	24.6851 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
222.1518 195.7900 205.5863 184.2442 180.5169 161.2462 154.8100 169.9432 169.6645 191.0531 202.0823 216.7899 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	222.1518	195.7900	205.5863	184.2442	180.5169	161.2462	154.8100	169.9432	169.6645	191.0531	202.0823	216.7899 (64)
Heat gains from water heating, kWh/month	98.2795	87.1516	92.7715	84.8877	84.4359	77.2409	75.8884	80.9202	80.0400	87.9392	90.8189	96.4967 (65)
Total per year (kWh/year) = Sum(64)m =												2253.8785 (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	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.8440	65.5876	53.3394	40.3814	30.1855	25.4839	27.5363	35.7927	48.0408	60.9989	71.1947	75.8963 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	491.2212	496.3186	483.4734	456.1277	421.6086	389.1655	367.4915	362.3941	375.2393	402.5850	437.1041	469.5472 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227 (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)	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442 (71)
Water heating gains (Table 5)	132.0962	129.6898	124.6929	117.8996	113.4892	107.2790	102.0005	108.7637	111.1666	118.1979	126.1374	129.6999 (72)
Total internal gains	814.7062	809.1408	779.0506	731.9535	682.8281	639.4732	614.5731	624.4953	651.9916	699.3266	751.9810	792.6883 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	2.1700	10.6334	0.6300	0.7000	0.7700	7.0519 (74)
East	9.5400	19.6403	0.6300	0.7000	0.7700	57.2621 (76)
South	3.1600	46.7521	0.6300	0.7000	0.7700	45.1502 (78)
West	16.8400	19.6403	0.6300	0.7000	0.7700	101.0791 (80)

Solar gains	210.5433	397.1698	627.2043	887.2090	1072.2467	1093.1549	1042.4225	903.8749	719.2096	463.3412	259.6506	175.1048 (83)
Total gains	1025.2495	1206.3107	1406.2549	1619.1625	1755.0748	1732.6281	1656.9956	1528.3702	1371.2011	1162.6678	1011.6317	967.7931 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	39.1229	39.1917	39.2594	39.5803	39.6410	39.9257	39.9257	39.9789	39.8156	39.6410	39.5185	39.3913
alpha	3.6082	3.6128	3.6173	3.6387	3.6427	3.6617	3.6617	3.6653	3.6544	3.6427	3.6346	3.6261
util living area	0.9856	0.9736	0.9450	0.8758	0.7539	0.5897	0.4461	0.4978	0.7306	0.9192	0.9757	0.9882 (86)
MIT	19.3540	19.5857	19.9586	20.4055	20.7426	20.9238	20.9789	20.9686	20.8304	20.3640	19.7704	19.3071 (87)
Th 2	19.9833	19.9849	19.9864	19.9938	19.9952	20.0016	20.0016	20.0028	19.9992	19.9952	19.9924	19.9895 (88)
util rest of house	0.9826	0.9681	0.9333	0.8497	0.7046	0.5136	0.3512	0.3996	0.6607	0.8963	0.9696	0.9857 (89)
MIT 2	17.7914	18.1274	18.6623	19.2893	19.7292	19.9416	19.9907	19.9852	19.8483	19.2487	18.4032	17.7273 (90)
Living area fraction									fLA = Living area / (4) =			0.1788 (91)
MIT	18.0707	18.3881	18.8940	19.4889	19.9104	20.1172	20.1674	20.1610	20.0239	19.4481	18.6476	18.0097 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0707	18.3881	18.8940	19.4889	19.9104	20.1172	20.1674	20.1610	20.0239	19.4481	18.6476	18.0097 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9742	0.9561	0.9171	0.8343	0.7001	0.5228	0.3674	0.4158	0.6626	0.8806	0.9582	0.9784 (94)
Ext temp.	998.7530	1153.2998	1289.6868	1350.8516	1228.6511	905.8989	608.8451	635.4763	908.5823	1023.8395	969.3629	946.8451 (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	2440.5548	2386.2779	2188.9363	1854.9525	1436.0877	958.1403	619.5271	652.2892	1031.6144	1547.6276	2026.0728	2430.7952 (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	1072.7005	828.5613	669.0416	362.9526	154.3328	0.0000	0.0000	0.0000	0.0000	389.6984	760.8311	1104.0589 (98)
Space heating per m2												5342.1773 (98)
												(98) / (4) = 33.8070 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5902.9583 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1072.7005	828.5613	669.0416	362.9526	154.3328	0.0000	0.0000	0.0000	0.0000	389.6984	760.8311	1104.0589	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1185.3045	915.5373	739.2725	401.0526	170.5335	0.0000	0.0000	0.0000	0.0000	430.6059	840.6973	1219.9546	(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	222.1518	195.7900	205.5863	184.2442	180.5169	161.2462	154.8100	169.9432	169.6645	191.0531	202.0823	216.7899	(64)
Efficiency of water heater (217)m	88.4649	88.2386	87.7348	86.5907	84.3992	79.8000	79.8000	79.8000	79.8000	86.6766	88.0230	88.5512	(216)
Fuel for water heating, kWh/month	251.1185	221.8870	234.3269	212.7760	213.8846	202.0629	193.9975	212.9614	212.6122	220.4206	229.5789	244.8187	(219)
Water heating fuel used												2650.4453	(219)
Annual totals kWh/year													
Space heating fuel - main system												5902.9583	(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)													521.6432 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 + 0.97 + 1068 + 1.00) =										-828.8227		-828.8227	(233)
Total delivered energy for all uses												8321.2242	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5902.9583	3.4800	205.4229 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2650.4453	3.4800	92.2355 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	521.6432	13.1900	68.8047 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-828.8227	13.1900	-109.3217 (252)
Total energy cost			387.0340 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8007 (257)
SAP value		88.8305
SAP rating (Section 12)		89 (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	5902.9583	0.2160	1275.0390 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2650.4453	0.2160	572.4962 (264)
Space and water heating			1847.5352 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	521.6432	0.5190	270.7328 (268)
Energy saving/generation technologies			
PV Unit	-828.8227	0.5190	-430.1590 (269)
Total kg/year			1727.0340 (272)
CO2 emissions per m2			10.9300 (273)
EI value			88.6010
EI rating			89 (274)
EI band			B

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Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8482 = 4.103$, stars = 4
Water heating environmental impact	$0.216 / 0.8482 = 0.2546$, 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	79.0100 (1b)	x 2.3900 (2b)	= 188.8339 (1b) - (3b)
First floor	79.0100 (1c)	x 2.6700 (2c)	= 210.9567 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 399.7906 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1251 (8)
Pressure test					Yes
Measured/design AP50					3.9300
Infiltration rate					0.3216 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2733 (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	0.3212	0.3007	0.3007	0.2733	0.2802	0.2665	0.2665	0.2597	0.2597	0.2802	0.2733	0.2802 (22b)
Effective ac	0.5516	0.5452	0.5452	0.5374	0.5392	0.5355	0.5355	0.5337	0.5337	0.5392	0.5374	0.5392 (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)			31.7100	1.1450	36.3092		(27)
Ground Floor			79.0100	0.1200	9.4812	84.0000	6636.8400 (28a)
Brick and Block	204.9800	33.8300	171.1500	0.2400	41.0760	42.2200	7225.9530 (29a)
Pitched Roof	79.0100		79.0100	0.1000	7.9010	9.1000	718.9910 (30)
Total net area of external elements Aum(A, m ²)			363.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	97.0994		(33)
GF Block			76.6500			75.0000	5748.7500 (32c)
GF Stud			27.8600			9.0000	250.7400 (32c)
FF Stud			170.6200			9.0000	1535.5800 (32c)
Internal Floor 1			79.0100			18.0000	1422.1800 (32d)
Internal Ceiling 1			79.0100			18.0000	1422.1800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	24961.2140 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.9624 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.1517 (36)
Total fabric heat loss						(33) + (36) =	103.2510 (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	72.7695	71.9286	71.9286	70.8937	71.1432	70.6504	70.6504	70.4132	70.4132	71.1432	70.8937	71.1432 (38)
Average = Sum(39)m / 12 =	176.0205	175.1796	175.1796	174.1447	174.3942	173.9014	173.9014	173.6642	173.6642	174.3942	174.1447	174.3942 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1139	1.1086	1.1086	1.1020	1.1036	1.1005	1.1005	1.0990	1.0990	1.1036	1.1020	1.1036 (40)
HLP (average)												1.1038 (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												2.9461 (42)
Average daily hot water use (litres/day)												104.1700 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.5870	110.4202	106.2534	102.0866	97.9198	93.7530	93.7530	97.9198	102.0866	106.2534	110.4202	114.5870 (44)
Energy conte	169.9292	148.6212	153.3637	133.7062	128.2943	110.7082	102.5874	117.7206	119.1265	138.8305	151.5443	164.5673 (45)
Energy content (annual)										Total = Sum(45)m =		1638.9995 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	25.4894	22.2932	23.0046	20.0559	19.2441	16.6062	15.3881	17.6581	17.8690	20.8246	22.7317	24.6851 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
222.1518 195.7900 205.5863 184.2442 180.5169 161.2462 154.8100 169.9432 169.6645 191.0531 202.0823 216.7899 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	222.1518	195.7900	205.5863	184.2442	180.5169	161.2462	154.8100	169.9432	169.6645	191.0531	202.0823	216.7899 (64)
Total per year (kWh/year) = Sum(64)m =												2253.8785 (64)
Heat gains from water heating, kWh/month	98.2795	87.1516	92.7715	84.8877	84.4359	77.2409	75.8884	80.9202	80.0400	87.9392	90.8189	96.4967 (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	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.8440	65.5876	53.3394	40.3814	30.1855	25.4839	27.5363	35.7927	48.0408	60.9989	71.1947	75.8963 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	491.2212	496.3186	483.4734	456.1277	421.6086	389.1655	367.4915	362.3941	375.2393	402.5850	437.1041	469.5472 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227 (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)	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442 (71)
Water heating gains (Table 5)	132.0962	129.6898	124.6929	117.8996	113.4892	107.2790	102.0005	108.7637	111.1666	118.1979	126.1374	129.6999 (72)
Total internal gains	814.7062	809.1408	779.0506	731.9535	682.8281	639.4732	614.5731	624.4953	651.9916	699.3266	751.9810	792.6883 (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	2.1700	13.4684	0.6300	0.7000	0.7700	8.9320 (74)
East	9.5400	25.1733	0.6300	0.7000	0.7700	73.3938 (76)
South	3.1600	56.5862	0.6300	0.7000	0.7700	54.6474 (78)
West	16.8400	25.1733	0.6300	0.7000	0.7700	129.5547 (80)

Solar gains	266.5280	428.3263	688.3678	975.5936	1107.5153	1248.4645	1144.1951	1036.6367	825.7442	539.2366	327.7389	209.7484 (83)
Total gains	1081.2342	1237.4671	1467.4184	1707.5470	1790.3434	1887.9377	1758.7682	1661.1320	1477.7358	1238.5632	1079.7199	1002.4368 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	39.3913	39.5803	39.5803	39.8156	39.7586	39.8713	39.8713	39.9257	39.9257	39.7586	39.8156	39.7586
alpha	3.6261	3.6387	3.6387	3.6544	3.6506	3.6581	3.6581	3.6617	3.6617	3.6506	3.6544	3.6506
util living area	0.9782	0.9648	0.9235	0.8246	0.6728	0.4536	0.3226	0.3305	0.6014	0.8636	0.9586	0.9823 (86)
MIT	19.6013	19.7851	20.1593	20.5840	20.8530	20.9741	20.9945	20.9943	20.9288	20.5907	20.0457	19.5717 (87)
Th 2	19.9895	19.9938	19.9938	19.9992	19.9979	20.0004	20.0004	20.0016	20.0016	19.9979	19.9992	19.9979 (88)
util rest of house	0.9733	0.9570	0.9070	0.7889	0.6106	0.3710	0.2267	0.2294	0.5131	0.8246	0.9477	0.9782 (89)
MIT 2	18.1547	18.4213	18.9510	19.5307	19.8616	19.9846	19.9987	20.0000	19.9507	19.5554	18.8034	18.1179 (90)
Living area fraction									fLA = Living area / (4) =			0.1788 (91)
MIT	18.4133	18.6651	19.1670	19.7190	20.0388	20.1615	20.1767	20.1777	20.1255	19.7405	19.0255	18.3778 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4133	18.6651	19.1670	19.7190	20.0388	20.1615	20.1767	20.1777	20.1255	19.7405	19.0255	18.3778 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9626	0.9434	0.8902	0.7776	0.6134	0.3846	0.2438	0.2474	0.5247	0.8127	0.9334	0.9688	(94)
Useful gains	1040.7467	1167.3965	1306.2657	1327.7082	1098.1205	726.1711	428.8131	411.0239	775.3902	1006.5600	1007.8084	971.1187	(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	2255.4099	2218.6656	2026.3111	1675.0971	1210.0886	741.0769	430.7082	412.9240	820.6578	1332.4587	1815.5425	2210.9382	(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	903.7095	706.4529	535.7137	250.1200	83.3042	0.0000	0.0000	0.0000	0.0000	242.4686	581.5685	922.4257	(98)
Space heating												4225.7632	(98)
Space heating per m2												26.7420	(99)
										(98) / (4) =			

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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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4669.3516 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	903.7095	706.4529	535.7137	250.1200	83.3042	0.0000	0.0000	0.0000	0.0000	242.4686	581.5685	922.4257	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	998.5740	780.6109	591.9489	276.3757	92.0489	0.0000	0.0000	0.0000	0.0000	267.9211	642.6172	1019.2550	(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	222.1518	195.7900	205.5863	184.2442	180.5169	161.2462	154.8100	169.9432	169.6645	191.0531	202.0823	216.7899	(64)
Efficiency of water heater (217)m	88.1673	87.9412	87.2553	85.6298	82.8947	79.8000	79.8000	79.8000	79.8000	85.4506	87.4754	88.2482	(216)
Fuel for water heating, kWh/month	251.9661	222.6374	235.6147	215.1636	217.7665	202.0629	193.9975	212.9614	212.6122	223.5831	231.0163	245.6592	(219)
Water heating fuel used												2665.0409	(219)
Annual totals kWh/year													
Space heating fuel - main system												4669.3516	(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)												521.6432	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 1184 * 1.00) =										-918.7195		-918.7195	(233)
Total delivered energy for all uses												7012.3162	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4669.3516	3.6300	169.4975 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2665.0409	3.6300	96.7410 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	521.6432	19.4400	101.4074 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-918.7195	19.4400	-178.5991 (252)
Total energy cost			298.6268 (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	4669.3516	0.2160	1008.5799 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2665.0409	0.2160	575.6488 (264)
Space and water heating			1584.2288 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	521.6432	0.5190	270.7328 (268)
Energy saving/generation technologies			
PV Unit	-918.7195	0.5190	-476.8154 (269)
Total kg/year			1417.0712 (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	4669.3516	1.2200	5696.6090 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2665.0409	1.2200	3251.3499 (264)
Space and water heating			8947.9589 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	521.6432	3.0700	1601.4447 (268)
Energy saving/generation technologies			

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PV Unit	-918.7195	3.0700	-2820.4690 (269)
Primary energy kWh/year			7959.1846 (272)
Primary energy kWh/m2/year			50.3682 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 89
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	-£ 41	-274 kg (19.3%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£41 1.73 kg/m²	B 90	B 90
Total Savings	£41 1.73 kg/m²		
Potential energy efficiency rating:		B 90	
Potential environmental impact rating:			B 90

Fuel prices for cost data on this page from database revision number 500 TEST (30 Jun 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£116	£126	-£10
Mains gas	£361	£311	£50
Space heating	£279	£281	-£1
Water heating	£97	£55	£42
Lighting	£101	£101	£0
Generated (PV)	-£179	-£179	£0
Total cost of fuels	£298	£258	£40
Total cost of uses	£298	£258	£41
Delivered energy	44 kWh/m²	36 kWh/m²	8 kWh/m²
Carbon dioxide emissions	1.4 tonnes	1.1 tonnes	0.3 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	50 kWh/m²	41 kWh/m²	10 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	79.0100 (1b)	x 2.3900 (2b)	= 188.8339 (1b) - (3b)
First floor	79.0100 (1c)	x 2.6700 (2c)	= 210.9567 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 399.7906 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1251 (8)
Pressure test					Yes
Measured/design AP50					3.9300
Infiltration rate					0.3216 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2733 (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	0.3485	0.3417	0.3348	0.3007	0.2938	0.2597	0.2597	0.2528	0.2733	0.2938	0.3075	0.3212 (22b)
Effective ac	0.5607	0.5584	0.5561	0.5452	0.5432	0.5337	0.5337	0.5320	0.5374	0.5432	0.5473	0.5516 (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)			31.7100	1.1450	36.3092		(27)
Ground Floor			79.0100	0.1200	9.4812	84.0000	6636.8400 (28a)
Brick and Block	204.9800	33.8300	171.1500	0.2400	41.0760	42.2200	7225.9530 (29a)
Pitched Roof	79.0100		79.0100	0.1000	7.9010	9.1000	718.9910 (30)
Total net area of external elements Aum(A, m ²)			363.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	97.0994		(33)
GF Block			76.6500			75.0000	5748.7500 (32c)
GF Stud			27.8600			9.0000	250.7400 (32c)
FF Stud			170.6200			9.0000	1535.5800 (32c)
Internal Floor 1			79.0100			18.0000	1422.1800 (32d)
Internal Ceiling 1			79.0100			18.0000	1422.1800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24961.2140 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 157.9624 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1517 (36)
Total fabric heat loss (33) + (36) = 103.2510 (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	73.9769	73.6658	73.3609	71.9286	71.6607	70.4132	70.4132	70.1822	70.8937	71.6607	72.2028	72.7695 (38)
Heat transfer coeff	177.2280	176.9169	176.6119	175.1796	174.9117	173.6642	173.6642	173.4332	174.1447	174.9117	175.4538	176.0205 (39)
Average = Sum(39)m / 12 =												175.1784 (39)
HLP	1.1216	1.1196	1.1177	1.1086	1.1069	1.0990	1.0990	1.0975	1.1020	1.1069	1.1103	1.1139 (40)
HLP (average)												1.1086 (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												2.9461 (42)
Average daily hot water use (litres/day)												104.1700 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.5870	110.4202	106.2534	102.0866	97.9198	93.7530	93.7530	97.9198	102.0866	106.2534	110.4202	114.5870 (44)
Energy conte	169.9292	148.6212	153.3637	133.7062	128.2943	110.7082	102.5874	117.7206	119.1265	138.8305	151.5443	164.5673 (45)
Energy content (annual)										Total = Sum(45)m =		1638.9995 (45)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.4894	22.2932	23.0046	20.0559	19.2441	16.6062	15.3881	17.6581	17.8690	20.8246	22.7317	24.6851 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 (56)												
If cylinder contains dedicated solar storage												
18.8578 17.0329 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 (57)												
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
212.0494 186.6652 194.0882 167.7141 157.6202 138.8630 131.6807 147.7443 154.4851 179.5550 192.3058 206.6876 (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												1.1065 (H8)
Utilisation factor												0.5949 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												104.1700 (H14)
Volume ratio Veff/V												1.1232 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-948.7477 (H17)
Solar input	-27.5118	-45.9093	-78.1887	-104.7883	-129.4571	-127.2770	-125.5950	-109.7330	-85.9429	-58.6889	-32.6329	-23.0227 (63)
Solar input (sum of months) = Sum (63)m =												-948.7477 (63)
Output from w/h												
184.5376 140.7559 115.8994 62.9258 28.1630 11.5860 6.0857 38.0114 68.5422 120.8661 159.6729 183.6649 (64)												
Total per year (kWh/year) = Sum (64)m =												1120.7109 (64)
Heat gains from water heating, kWh/month												
90.1976 79.8518 83.5730 71.6636 66.1186 59.3343 57.3849 63.1611 67.8965 78.7407 82.9977 88.4148 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
73.8440 65.5876 53.3394 40.3814 30.1855 25.4839 27.5363 35.7927 48.0408 60.9989 71.1947 75.8963 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
491.2212 496.3186 483.4734 456.1277 421.6086 389.1655 367.4915 362.3941 375.2393 402.5850 437.1041 469.5472 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.6227 55.6227 55.6227 55.6227 55.6227 55.6227 55.6227 55.6227 55.6227 55.6227 55.6227 55.6227 (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)												
-117.8442 -117.8442 -117.8442 -117.8442 -117.8442 -117.8442 -117.8442 -117.8442 -117.8442 -117.8442 -117.8442 -117.8442 (71)												
Water heating gains (Table 5)												
121.2334 118.8271 112.3293 99.5328 88.8690 82.4087 77.1303 84.8940 94.3006 105.8343 115.2746 118.8371 (72)												
Total internal gains	803.8434	798.2780	766.6870	713.5867	658.2080	614.6029	589.7029	600.6256	635.1256	686.9630	741.1183	781.8255 (73)

6. Solar gains

[Jan]												
				Area	Solar flux		g		FF		Access	Gains
				m2	Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
North				2.1700	10.6334		0.6300		0.7000		0.7700	7.0519 (74)
East				9.5400	19.6403		0.6300		0.7000		0.7700	57.2621 (76)
South				3.1600	46.7521		0.6300		0.7000		0.7700	45.1502 (78)
West				16.8400	19.6403		0.6300		0.7000		0.7700	101.0791 (80)
Solar gains	210.5433	397.1698	627.2043	887.2090	1072.2467	1093.1549	1042.4225	903.8749	719.2096	463.3412	259.6506	175.1048 (83)
Total gains	1014.3867	1195.4479	1393.8913	1600.7957	1730.4546	1707.7578	1632.1253	1504.5005	1354.3352	1150.3042	1000.7689	956.9303 (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	39.1229	39.1917	39.2594	39.5803	39.6410	39.9257	39.9257	39.9789	39.8156	39.6410	39.5185	39.3913
alpha	3.6082	3.6128	3.6173	3.6387	3.6427	3.6617	3.6617	3.6653	3.6544	3.6427	3.6346	3.6261
util living area	0.9861	0.9743	0.9463	0.8790	0.7597	0.5963	0.4522	0.5046	0.7359	0.9214	0.9765	0.9886 (86)
MIT	19.3453	19.5775	19.9502	20.3962	20.7355	20.9209	20.9779	20.9672	20.8261	20.3564	19.7621	19.2983 (87)
Th 2	19.9833	19.9849	19.9864	19.9938	19.9952	20.0016	20.0016	20.0028	19.9992	19.9952	19.9924	19.9895 (88)
util rest of house												
	0.9831	0.9689	0.9348	0.8533	0.7109	0.5199	0.3563	0.4055	0.6664	0.8989	0.9705	0.9862 (89)
MIT 2	17.7789	18.1156	18.6507	19.2771	19.7210	19.9392	19.9902	19.9844	19.8440	19.2387	18.3913	17.7146 (90)
Living area fraction									fLA = Living area / (4) =			0.1788 (91)
MIT	18.0589	18.3770	18.8830	19.4772	19.9024	20.1147	20.1668	20.1601	20.0195	19.4385	18.6364	17.9977 (92)
Temperature adjustment												0.0000

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Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

adjusted MIT 18.0589 18.3770 18.8830 19.4772 19.9024 20.1147 20.1668 20.1601 20.0195 19.4385 18.6364 17.9977 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9571	0.9187	0.8378	0.7059	0.5290	0.3727	0.4217	0.6679	0.8832	0.9594	0.9790	(94)
Useful gains	988.9236	1144.1104	1280.6308	1341.0977	1221.5169	903.4512	608.2335	634.5136	904.5878	1015.9601	960.1025	936.8622	(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	2438.4623	2384.3054	2186.9839	1852.9096	1434.6961	957.7040	619.4217	652.1224	1030.8564	1545.9547	2024.0995	2428.6870	(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	1078.4568	833.4111	674.3267	368.5046	158.6053	0.0000	0.0000	0.0000	0.0000	394.3160	766.0778	1109.9177	(98)
Space heating												5383.6160	(98)
Space heating per m2												(98) / (4) =	34.0692 (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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5948.7469 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1078.4568	833.4111	674.3267	368.5046	158.6053	0.0000	0.0000	0.0000	0.0000	394.3160	766.0778	1109.9177	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1191.6650	920.8962	745.1124	407.1874	175.2545	0.0000	0.0000	0.0000	0.0000	435.7083	846.4948	1226.4284	(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	184.5376	140.7559	115.8994	62.9258	28.1630	11.5860	6.0857	38.0114	68.5422	120.8661	159.6729	183.6649	(64)
Efficiency of water heater (217)m	88.7611	88.7800	88.7546	88.7641	88.7065	79.8000	79.8000	79.8000	79.8000	87.7399	88.4543	88.8093	(216)
Fuel for water heating, kWh/month	207.9038	158.5447	130.5842	70.8910	31.7486	14.5188	7.6262	47.6333	85.8925	137.7549	180.5145	206.8082	(219)
Water heating fuel used												1280.4207	(219)
Annual totals kWh/year													
Space heating fuel - main system												5948.7469	(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)													521.6432 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 1068 * 1.00) =										-828.8227		-828.8227	(233)
Total delivered energy for all uses												7046.9882	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5948.7469	3.4800	207.0164	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1280.4207	3.4800	44.5586	(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	521.6432	13.1900	68.8047	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-828.8227	13.1900	-109.3217	(252)
Total energy cost			347.5456	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7190	(257)
SAP value		89.9701	
SAP rating (Section 12)		90	(258)
SAP band		B	

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Calculation Type: New Build (As Built)

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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	5948.7469	0.2160	1284.9293 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1280.4207	0.2160	276.5709 (264)
Space and water heating			1561.5002 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	521.6432	0.5190	270.7328 (268)
Energy saving/generation technologies			
PV Unit	-828.8227	0.5190	-430.1590 (269)
Total kg/year			1466.9491 (272)
CO2 emissions per m2			9.2800 (273)
EI value			90.3176
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	79.0100 (1b)	x 2.3900 (2b)	= 188.8339 (1b) - (3b)
First floor	79.0100 (1c)	x 2.6700 (2c)	= 210.9567 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 399.7906 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1251 (8)
Pressure test					Yes
Measured/design AP50					3.9300
Infiltration rate					0.3216 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2733 (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	0.3212	0.3007	0.3007	0.2733	0.2802	0.2665	0.2665	0.2597	0.2597	0.2802	0.2733	0.2802 (22b)
Effective ac	0.5516	0.5452	0.5452	0.5374	0.5392	0.5355	0.5355	0.5337	0.5337	0.5392	0.5374	0.5392 (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)			31.7100	1.1450	36.3092		(27)
Ground Floor			79.0100	0.1200	9.4812	84.0000	6636.8400 (28a)
Brick and Block	204.9800	33.8300	171.1500	0.2400	41.0760	42.2200	7225.9530 (29a)
Pitched Roof	79.0100		79.0100	0.1000	7.9010	9.1000	718.9910 (30)
Total net area of external elements Aum(A, m ²)			363.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	97.0994		(33)
GF Block			76.6500			75.0000	5748.7500 (32c)
GF Stud			27.8600			9.0000	250.7400 (32c)
FF Stud			170.6200			9.0000	1535.5800 (32c)
Internal Floor 1			79.0100			18.0000	1422.1800 (32d)
Internal Ceiling 1			79.0100			18.0000	1422.1800 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		24961.2140 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.9624 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.1517 (36)
Total fabric heat loss						(33) + (36) =	103.2510 (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	72.7695	71.9286	71.9286	70.8937	71.1432	70.6504	70.6504	70.4132	70.4132	71.1432	70.8937	71.1432 (38)
Average = Sum(39)m / 12 =	176.0205	175.1796	175.1796	174.1447	174.3942	173.9014	173.9014	173.6642	173.6642	174.3942	174.1447	174.3942 (39)
												174.4153 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1139	1.1086	1.1086	1.1020	1.1036	1.1005	1.1005	1.0990	1.0990	1.1036	1.1020	1.1036 (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													2.9461 (42)
Average daily hot water use (litres/day)													104.1700 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.5870	110.4202	106.2534	102.0866	97.9198	93.7530	93.7530	97.9198	102.0866	106.2534	110.4202	114.5870 (44)
Energy conte	169.9292	148.6212	153.3637	133.7062	128.2943	110.7082	102.5874	117.7206	119.1265	138.8305	151.5443	164.5673 (45)
Energy content (annual)										Total = Sum(45)m =		1638.9995 (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	25.4894	22.2932	23.0046	20.0559	19.2441	16.6062	15.3881	17.6581	17.8690	20.8246	22.7317	24.6851 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
18.8578 17.0329 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 (57)												
Primary loss												23.2624 (59)
Total heat required for water heating calculated for each month												
212.0494 186.6652 194.0882 167.7141 157.6202 138.8630 131.6807 147.7443 154.4851 179.5550 192.3058 206.6876 (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												1.2362 (H8)
Utilisation factor												0.5547 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												104.1700 (H14)
Volume ratio Veff/V												1.1232 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-988.1670 (H17)
Solar input	-32.2452	-45.8562	-79.5723	-107.0383	-124.3857	-135.2955	-128.2808	-116.9796	-91.5597	-63.2828	-38.1387	-25.5322 (63)
Solar input (sum of months) = Sum (63)m =												-988.1670 (63)
Output from w/h												
179.8042 140.8090 114.5158 60.6758 33.2345 3.5675 3.3999 30.7647 62.9254 116.2722 154.1672 181.1553 (64)												
Total per year (kWh/year) = Sum (64)m =												1081.2916 (64)
Heat gains from water heating, kWh/month												
90.1976 79.8518 83.5730 71.6636 66.1186 59.3343 57.3849 63.1611 67.8965 78.7407 82.9977 88.4148 (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	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663	176.7663 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.8440	65.5876	53.3394	40.3814	30.1855	25.4839	27.5363	35.7927	48.0408	60.9989	71.1947	75.8963 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	491.2212	496.3186	483.4734	456.1277	421.6086	389.1655	367.4915	362.3941	375.2393	402.5850	437.1041	469.5472 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227	55.6227 (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)	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442	-117.8442 (71)
Water heating gains (Table 5)	121.2334	118.8271	112.3293	99.5328	88.8690	82.4087	77.1303	84.8940	94.3006	105.8343	115.2746	118.8371 (72)
Total internal gains	803.8434	798.2780	766.6870	713.5867	658.2080	614.6029	589.7029	600.6256	635.1256	686.9630	741.1183	781.8255 (73)

6. Solar gains

[Jan]												Gains
				Area	Solar flux			g	FF		Access	Gains
				m2	Table 6a			Specific data	Specific data		factor	W
					W/m2			or Table 6b	or Table 6c		Table 6d	
North				2.1700	13.4684			0.6300	0.7000		0.7700	8.9320 (74)
East				9.5400	25.1733			0.6300	0.7000		0.7700	73.3938 (76)
South				3.1600	56.5862			0.6300	0.7000		0.7700	54.6474 (78)
West				16.8400	25.1733			0.6300	0.7000		0.7700	129.5547 (80)

Solar gains	266.5280	428.3263	688.3678	975.5936	1107.5153	1248.4645	1144.1951	1036.6367	825.7442	539.2366	327.7389	209.7484 (83)
Total gains	1070.3714	1226.6043	1455.0548	1689.1802	1765.7233	1863.0674	1733.8979	1637.2623	1460.8698	1226.1996	1068.8571	991.5740 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	39.3913	39.5803	39.5803	39.8156	39.7586	39.8713	39.8713	39.9257	39.9257	39.7586	39.8156	39.7586	
util living area	3.6261	3.6387	3.6387	3.6544	3.6506	3.6581	3.6581	3.6617	3.6617	3.6506	3.6544	3.6506	
0.9789 0.9657 0.9252 0.8284 0.6790 0.4590 0.3271 0.3351 0.6067 0.8666 0.9598 0.9829 (86)													
MIT	19.5929	19.7771	20.1516	20.5766	20.8484	20.9730	20.9943	20.9940	20.9268	20.5847	20.0379	19.5631 (87)	
Th 2	19.9895	19.9938	19.9938	19.9992	19.9979	20.0004	20.0004	20.0016	20.0016	19.9979	19.9992	19.9979 (88)	
util rest of house													
0.9741 0.9581 0.9089 0.7931 0.6170 0.3756 0.2299 0.2327 0.5181 0.8281 0.9491 0.9789 (89)													
MIT 2	18.1427	18.4100	18.9406	19.5215	19.8568	19.9839	19.9986	19.9999	19.9490	19.5481	18.7925	18.1056 (90)	
Living area fraction													
MIT	18.4019	18.6544	19.1571	19.7101	20.0341	20.1608	20.1766	20.1776	20.1238	19.7334	19.0152	18.3662 (92)	
Temperature adjustment												0.0000	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

adjusted MIT 18.4019 18.6544 19.1571 19.7101 20.0341 20.1608 20.1766 20.1776 20.1238 19.7334 19.0152 18.3662 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9446	0.8921	0.7815	0.6194	0.3894	0.2472	0.2510	0.5296	0.8160	0.9350	0.9697	(94)
Useful gains	1031.3357	1158.6352	1298.0962	1320.0661	1093.7016	725.4365	428.7013	410.9099	773.7157	1000.5723	999.3676	961.4925	(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	2253.4032	2216.7920	2024.5673	1673.5477	1209.2666	740.9504	430.6883	412.9036	820.3595	1331.2255	1813.7439	2208.9060	(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	909.2182	711.0814	540.4945	254.5067	85.9803	0.0000	0.0000	0.0000	0.0000	246.0059	586.3510	928.0756	(98)
Space heating												4261.7137	(98)
Space heating per m2												(98) / (4) =	26.9695 (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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4709.0760 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	909.2182	711.0814	540.4945	254.5067	85.9803	0.0000	0.0000	0.0000	0.0000	246.0059	586.3510	928.0756	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1004.6610	785.7253	597.2315	281.2229	95.0059	0.0000	0.0000	0.0000	0.0000	271.8298	647.9016	1025.4979	(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	179.8042	140.8090	114.5158	60.6758	33.2345	3.5675	3.3999	30.7647	62.9254	116.2722	154.1672	181.1553	(64)
Efficiency of water heater (217)m	88.5399	88.5377	88.4271	88.2227	87.2390	79.8000	79.8000	79.8000	79.8000	86.7661	88.0423	88.5607	(216)
Fuel for water heating, kWh/month	203.0771	159.0384	129.5031	68.7758	38.0959	4.4705	4.2605	38.5522	78.8539	134.0065	175.1058	204.5551	(219)
Water heating fuel used												1238.2948	(219)
Annual totals kWh/year													
Space heating fuel - main system												4709.0760	(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)												521.6432	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.97 * 1184 * 1.00) =										-918.7195		-918.7195	(233)
Total delivered energy for all uses												5675.2945	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4709.0760	3.6300	170.9395	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1238.2948	3.6300	44.9501	(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	521.6432	19.4400	101.4074	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-918.7195	19.4400	-178.5991	(252)
Total energy cost			257.9979	(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	4709.0760	0.2160	1017.1604	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1238.2948	0.2160	267.4717	(264)
Space and water heating			1284.6321	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy for lighting	521.6432	0.5190	270.7328 (268)
Energy saving/generation technologies			
PV Unit	-918.7195	0.5190	-476.8154 (269)
Total kg/year			1143.4245 (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	4709.0760	1.2200	5745.0727 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1238.2948	1.2200	1510.7197 (264)
Space and water heating			7255.7924 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	521.6432	3.0700	1601.4447 (268)
Energy saving/generation technologies			
PV Unit	-918.7195	3.0700	-2820.4690 (269)
Primary energy kWh/year			6420.5181 (272)
Primary energy kWh/m2/year			40.6310 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 22	Issued on Date	22/08/2022
Assessment Reference	As Built	Prop Type Ref	Fv
Project	15 Shaw Road, WEST END, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.15	TER	15.66
Environmental	89 B	% DER<TER	22.41		
CO ₂ Emissions (t/year)	1.42	DFEE	45.08	TREE	57.01
General Requirements Compliance	Pass	% DFEE<TFEE	20.93		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Building Elements

Roof 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 22	Issued on Date	22/08/2022
Assessment Reference	As Built	Prop Type Ref	Fv
Project	15 Shaw Road, WEST END, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.15	TER	15.66
Environmental	89 B	% DER<TER	22.41		
CO ₂ Emissions (t/year)	1.42	DFEE	45.08	TFEE	57.01
General Requirements Compliance	Pass	% DFEE<TFEE	20.93		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Wall 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 22	Issued on Date	22/08/2022
Assessment Reference	As Built	Prop Type Ref	Fv
Project	15 Shaw Road, WEST END, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	89 B	DER	12.15	TER	15.66
Environmental	89 B	% DER<TER	22.41		
CO ₂ Emissions (t/year)	1.42	DFEE	45.08	TFEE	57.01
General Requirements Compliance	Pass	% DFEE<TFEE	20.93		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 22	Issued on Date	22/08/2022
Assessment Reference	As Built	Prop Type Ref	Fv
Property	15 Shaw Road, WEST END, SO30 3JZ		
SAP Rating	89 B	DER	12.15
Environmental	89 B	TER	15.66
CO ₂ Emissions (t/year)	1.42	% DER<TER	22.41
General Requirements Compliance	Pass	DfEE	45.08
		TFEE	57.01
		% DfEE<TFEE	20.93
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

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

6.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	40.51 m	79.01 m ²
	1st Storey:	40.51 m	2.39 m
			2.67 m

7.0 Living Area	28.25	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	157.96	kJ/m²K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	204.98	171.15

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

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
GF Block	Dense block, plasterboard on dabs		75.00	76.65
GF Stud	Plasterboard on timber frame		9.00	27.86
FF Stud	Plasterboard on timber frame		9.00	170.62

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	79.01	79.01

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	79.01

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	79.01

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	79.01

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.12	
Front Shaded	Window	[1] Brick and Block	East	None	1.15	Yes				1.92	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					7.62	
Side Elevation	Window	[1] Brick and Block	South	None	0.00					3.16	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					16.84	
Side Elevation	Window	[1] Brick and Block	North	None	0.00					2.17	

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)	2.52	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	10.98	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.54	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	5.54	0.056	No	Birtley Supatherm
Independently assessed	E3 Sill	17.04	0.021	No	Knauf P5
Independently assessed	E4 Jamb	54.90	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	40.51	0.022	No	Knauf P10
Independently assessed	E6 Intermediate floor within a dwelling	40.51	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	25.50	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	15.01	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	30.30	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	10.10	-0.091	No	Knauf P24

Y-value	0.017	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	3.93	m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

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				5
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	26	
Total number of L.E.L. fittings	26	
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.	18911	
Fuel Type	Mains gas	
Main Heating	BGB	
SAP Code	102	
In Winter	90.5	
In Summer	79.8	
Controls	CBI Time and temperature zone control	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2110	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	

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	Hot Water Cylinder			
Cylinder Stat	Yes			
Cylinder In Heated Space	Yes			
Independent Time Control	Yes			
Insulation Type	Measured Loss			
Cylinder Volume	215.00	L		
Loss	1.73	kWh/day		
Pipes insulation	Fully insulated primary pipework			
31.0 Thermal Store	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.97	South	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£41	B 90	