



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 19 Fieldfare Crescent, Botley
SOUTHAMPTON, SO32 2TW

Contact: Tobias Whiting
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Report Issue Date: 19/12/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 45			Issued on Date	19/12/2023
Assessment Reference	As Built	Prop Type Ref	K		
Property	19 Fieldfare Crescent, Botley, SOUTHAMPTON, SO32 2TW				
SAP Rating	90 B	DER	11.80	TER	15.83
Environmental	90 B	% DER<TER	25.46		
CO ₂ Emissions (t/year)	1.19	DFEE	43.88	TFEE	54.73
General Requirements Compliance	Pass	% DFEE<TFEE	19.82		
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)	15.83	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.80	kgCO ₂ /m ²	Pass
	-4.03 (-25.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.73	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.88	kWh/m ² /yr	
	-10.8 (-19.7%)	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
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.20 (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 12 S NG

Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.94 kWh/day
Permitted by DBSCG 2.24

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

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 East

0.66 m², No overhang

Windows facing South East

17.45 m², No overhang

Windows facing North West

9.04 m², Overhang twice as wide as window, ratio 0.41

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Roof U-value

0.10 W/m²K

Floor U-value

0.11 W/m²K

Door U-value

1.10 W/m²K

Thermal bridging ψ -value

0.024 W/m²K

Photovoltaic array

1.30 kW

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THERMAL BRIDGING

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Environmental	90 B	TER	15.83
CO ₂ Emissions (t/year)	1.19	% DER<TER	25.46
General Requirements Compliance	Pass	DFEE	43.88
		TFEE	54.73
		% DFEE<TFEE	19.82
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	1.26	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	0.92	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	3.60	0.24	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	1.41	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	6.28	0.42	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	12.06	0.25	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	36.60	0.59	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.062	35.41	2.20	BE-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	33.07	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	36.21	2.17	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	0.240	3.54	0.85	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	1.27	0.06	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	29.76	1.16	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	9.54	-0.87	Knauf P24

Total: **7.64** W/mK:
Y-Value: **0.024** W/m²K:

FULL SAP CALCULATION PRINTOUT

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General Requirements Compliance	Pass	% DFEE<TFEE	19.82		
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS BUILT

Detached House, total floor area 138 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) 15.83 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.80 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.20 (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 12 S NG

Efficiency: 89.8% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.94 kWh/day
Permitted by DBSCG 2.24 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Programmer, room thermostat and TRVs 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 East: 0.66 m², No overhang
Windows facing South East: 17.45 m², No overhang
Windows facing North West: 9.04 m², Overhang twice as wide as window, ratio 0.41
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Roof U-value 0.10 W/m²K
Floor U-value 0.11 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.024 W/m²K
Photovoltaic array 1.30 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	69.4400 (1b)	x 2.3900 (2b)	= 165.9616 (1b) - (3b)
First floor	68.2200 (1c)	x 2.6700 (2c)	= 182.1474 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.1090 (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					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) = 0.1436 (8)
Pressure test					Yes
Measured/design AP50					4.2000
Infiltration rate					0.3536 (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) =	0.3006 (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	0.3832	0.3757	0.3682	0.3306	0.3231	0.2856	0.2856	0.2780	0.3006	0.3231	0.3382	0.3532 (22b)
Effective ac	0.5734	0.5706	0.5678	0.5547	0.5522	0.5408	0.5408	0.5387	0.5452	0.5522	0.5572	0.5624 (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		(26a)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878		(27)
Ground Floor			69.4400	0.1100	7.6384	140.0000	9721.6000 (28a)
Brick and Block	172.9300	29.2700	143.6600	0.2400	34.4784	42.2200	6065.3252 (29a)
Pitched Roof	69.4400		69.4400	0.1000	6.9440	9.0000	624.9600 (30)
Total net area of external elements Aum(A, m ²)			311.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4806		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.9100			9.0000	485.1900 (32c)
First Floor Stud			159.7900			9.0000	1438.1100 (32c)
Internal Floor 1			68.2200			18.0000	1227.9600 (32d)
Internal Ceiling 1			68.2200			18.0000	1227.9600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25015.8552 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7220 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6381 (36)
Total fabric heat loss (33) + (36) = 90.1187 (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	65.8745	65.5469	65.2258	63.7175	63.4353	62.1217	62.1217	61.8784	62.6277	63.4353	64.0062	64.6030 (38)
Heat transfer coeff	155.9932	155.6656	155.3445	153.8362	153.5540	152.2404	152.2404	151.9971	152.7464	153.5540	154.1249	154.7217 (39)
Average = Sum(39)m / 12 =												153.8349 (39)
HLP	1.1332	1.1308	1.1285	1.1175	1.1155	1.1059	1.1059	1.1041	1.1096	1.1155	1.1196	1.1239 (40)
HLP (average)												1.1175 (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												2.9125 (42)
Average daily hot water use (litres/day)												103.3717 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7089	109.5740	105.4392	101.3043	97.1694	93.0345	93.0345	97.1694	101.3043	105.4392	109.5740	113.7089 (44)
Energy conte	168.6270	147.4822	152.1885	132.6816	127.3111	109.8598	101.8013	116.8185	118.2137	137.7666	150.3830	163.3062 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4396 (45)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.2940	22.1223	22.8283	19.9022	19.0967	16.4790	15.2702	17.5228	17.7320	20.6650	22.5575	24.4959 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0476 (55)
Total storage loss												
32.4756	29.3328	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756	31.4280	32.4756	31.4280	32.4756	(56)
If cylinder contains dedicated solar storage												
32.4756	29.3328	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756	31.4280	32.4756	31.4280	32.4756	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442 (64)
Heat gains from water heating, kWh/month	100.6589	89.3130	95.1931	87.2686	86.9214	79.6804	78.4393	83.4325	82.4580	90.3978	93.1544	98.8897 (65)
Total per year (kWh/year) = Sum(64)m =												2282.7096 (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	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.5802	24.4965	19.9219	15.0821	11.2741	9.5180	10.2846	13.3683	17.9429	22.7826	26.5907	28.3467	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.7354	309.9184	301.8974	284.8218	263.2669	243.0083	229.4743	226.2914	234.3123	251.3879	272.9429	293.2015	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	(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)	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	(71)
Water heating gains (Table 5)	135.2942	132.9063	127.9477	121.2064	116.8298	110.6672	105.4292	112.1405	114.5251	121.5024	129.3811	132.9163	(72)
Total internal gains	539.2972	537.0086	519.4544	490.7978	461.0581	432.8810	414.8755	421.4876	436.4677	465.3604	498.6020	524.1519	(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	
Northeast					0.6600	11.2829		0.6300	0.7000	0.7700		2.2758 (75)	
Southeast					17.4500	36.7938		0.6300	0.7000	0.7700		196.2196 (77)	
Northwest					9.0400	11.2829		0.6300	0.7000	0.7700		31.1719 (81)	
Solar gains	229.6672	402.3182	579.9794	768.0859	905.4681	918.7793	877.5369	772.0075	644.6440	452.6040	277.1116	195.2381 (83)	
Total gains	768.9644	939.3268	1099.4338	1258.8837	1366.5263	1351.6603	1292.4124	1193.4951	1081.1117	917.9644	775.7136	719.3900 (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	44.5458	44.6396	44.7319	45.1704	45.2534	45.6439	45.6439	45.7170	45.4927	45.2534	45.0858	44.9119	
alpha	3.9697	3.9760	3.9821	4.0114	4.0169	4.0429	4.0429	4.0478	4.0328	4.0169	4.0057	3.9941	
util living area	0.9944	0.9873	0.9697	0.9215	0.8179	0.6545	0.5001	0.5560	0.7910	0.9510	0.9890	0.9957	(86)
MIT	19.3924	19.6201	19.9626	20.3851	20.7278	20.9212	20.9793	20.9687	20.8254	20.3650	19.7950	19.3516	(87)
Th 2	19.9738	19.9758	19.9777	19.9866	19.9882	19.9960	19.9960	19.9974	19.9930	19.9882	19.9849	19.9813	(88)
util rest of house	0.9930	0.9841	0.9619	0.9009	0.7712	0.5731	0.3941	0.4474	0.7221	0.9339	0.9858	0.9946	(89)
MIT 2	18.5051	18.7326	19.0716	19.4856	19.7963	19.9548	19.9892	19.9862	19.8880	19.4757	18.9147	18.4702	(90)
Living area fraction									fLA = Living area / (4) =			0.2062	(91)
MIT	18.6881	18.9156	19.2554	19.6711	19.9884	20.1541	20.1934	20.1888	20.0814	19.6591	19.0963	18.6520	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6881	18.9156	19.2554	19.6711	19.9884	20.1541	20.1934	20.1888	20.0814	19.6591	19.0963	18.6520	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9906	0.9797	0.9550	0.8933	0.7712	0.5868	0.4156	0.4691	0.7289	0.9269	0.9819	0.9927	(94)
Ext temp.	761.7346	920.2842	1049.9252	1124.5258	1053.9150	793.1186	537.1727	559.8792	787.9808	850.8327	761.6502	714.1090	(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	2244.4468	2181.7533	1981.4765	1656.9897	1272.7199	845.5635	547.0637	575.8848	913.6296	1391.0581	1848.9252	2236.0412	(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	1103.1379	847.7073	693.0741	383.3740	162.7908	0.0000	0.0000	0.0000	0.0000	401.9277	782.8380	1132.3175	(98)
Space heating per m2												5507.1673	(98)
												(98) / (4) =	40.0056 (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 %)													90.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6065.1623 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1103.1379	847.7073	693.0741	383.3740	162.7908	0.0000	0.0000	0.0000	0.0000	401.9277	782.8380	1132.3175	(98)
Space heating efficiency (main heating system 1)	90.8000	90.8000	90.8000	90.8000	90.8000	0.0000	0.0000	0.0000	0.0000	90.8000	90.8000	90.8000	(210)
Space heating fuel (main heating system)	1214.9095	933.5983	763.2975	422.2181	179.2851	0.0000	0.0000	0.0000	0.0000	442.6517	862.1564	1247.0457	(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	224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442	(64)
Efficiency of water heater	88.7952	88.5616	88.0846	86.9952	84.8040	80.1000	80.1000	80.1000	80.1000	87.0222	88.3570	80.1000	(216)
Fuel for water heating, kWh/month	252.6768	223.3771	236.0532	214.5195	215.8496	204.4942	196.6783	215.4263	214.9234	222.3624	231.2471	246.4616	(219)
Water heating fuel used												2674.0695	(219)
Annual totals kWh/year													
Space heating fuel - main system												6065.1623	(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)												487.0745	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.30 * 1029 * 1.00) =										-1070.3542		-1070.3542	(233)
Total delivered energy for all uses												8230.9521	(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	6065.1623	0.2160	1310.0751 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2674.0695	0.2160	577.5990 (264)
Space and water heating			1887.6741 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	487.0745	0.5190	252.7917 (268)
Energy saving/generation technologies			
PV Unit	-1070.3542	0.5190	-555.5138 (269)
Total CO2, kg/year			1623.8769 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.8000 (273)

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

DER			11.8000 ZC1
Total Floor Area		TFA	137.6600
Assumed number of occupants		N	2.9125
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			13.2039 ZC2
CO2 emissions from cooking, equation (L16)			1.3722 ZC3
Total CO2 emissions			26.3761 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			26.3761 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	69.4400 (1b)	x 2.3900 (2b)	= 165.9616 (1b) - (3b)
First floor	68.2200 (1c)	x 2.6700 (2c)	= 182.1474 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.1090 (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) =	0.1149 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3649 (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) =					0.3102 (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	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3645	(22b)				
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(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 Semi-glazed door			2.1200	1.2000	2.5440			(26a)				
TER Opening Type (Uw = 1.40)			27.1500	1.3258	35.9943			(27)				
Ground Floor			69.4400	0.1300	9.0272			(28a)				
Brick and Block	172.9300	29.2700	143.6600	0.1800	25.8588			(29a)				
Pitched Roof	69.4400		69.4400	0.1300	9.0272			(30)				
Total net area of external elements Aum(A, m2)			311.8100					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		82.4515			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								13.9673 (36)				
Total fabric heat loss						(33) + (36) =		96.4188 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 66.4210	Feb 66.0722	Mar 65.7302	Apr 64.1243	May 63.8238	Jun 62.4251	Jul 62.4251	Aug 62.1661	Sep 62.9639	Oct 63.8238	Nov 64.4317	Dec 65.0671 (38)
Heat transfer coeff	162.8398	162.4910	162.1491	160.5431	160.2426	158.8439	158.8439	158.5849	159.3827	160.2426	160.8505	161.4860 (39)
Average = Sum(39)m / 12 =												160.5417 (39)
HLP	Jan 1.1829	Feb 1.1804	Mar 1.1779	Apr 1.1662	May 1.1640	Jun 1.1539	Jul 1.1539	Aug 1.1520	Sep 1.1578	Oct 1.1640	Nov 1.1685	Dec 1.1731 (40)
HLP (average)												1.1662 (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												2.9125 (42)
Average daily hot water use (litres/day)												103.3717 (43)
Daily hot water use	Jan 113.7089	Feb 109.5740	Mar 105.4392	Apr 101.3043	May 97.1694	Jun 93.0345	Jul 93.0345	Aug 97.1694	Sep 101.3043	Oct 105.4392	Nov 109.5740	Dec 113.7089 (44)
Energy conte	168.6270	147.4822	152.1885	132.6816	127.3111	109.8598	101.8013	116.8185	118.2137	137.7666	150.3830	163.3062 (45)
Energy content (annual)												Total = Sum(45)m = 1626.4396 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.2940	22.1223	22.8283	19.9022	19.0967	16.4790	15.2702	17.5228	17.7320	20.6650	22.5575	24.4959 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (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)												0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (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	219.5531	193.4800	203.1145	181.9649	178.2372	159.1431	152.7274	167.7445	167.4970	188.6927	199.6663	214.2323 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	219.5531	193.4800	203.1145	181.9649	178.2372	159.1431	152.7274	167.7445	167.4970	188.6927	199.6663	214.2323 (64)
Heat gains from water heating, kWh/month	96.8093	85.8360	91.3435	83.5433	83.0718	75.9550	74.5898	79.5830	78.7327	86.5483	89.4290	95.0402 (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)
(66)m	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.5802	24.4965	19.9219	15.0821	11.2741	9.5180	10.2846	13.3683	17.9429	22.7826	26.5907	28.3467	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.7354	309.9184	301.8974	284.8218	263.2669	243.0083	229.4743	226.2914	234.3123	251.3879	272.9429	293.2015	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	(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)	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	(71)
Water heating gains (Table 5)	130.1201	127.7322	122.7736	116.0323	111.6557	105.4931	100.2551	106.9664	109.3509	116.3283	124.2069	127.7422	(72)
Total internal gains	534.1231	531.8345	514.2803	485.6237	455.8840	427.7069	409.7014	416.3135	431.2935	460.1863	493.4279	518.9777	(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
Northeast					0.6600	11.2829		0.6300	0.7000	0.7700	2.2758 (75)	
Southeast					17.4500	36.7938		0.6300	0.7000	0.7700	196.2196 (77)	
Northwest					9.0400	11.2829		0.6300	0.7000	0.7700	31.1719 (81)	
Solar gains	229.6672	402.3182	579.9794	768.0859	905.4681	918.7793	877.5369	772.0075	644.6440	452.6040	277.1116	195.2381 (83)
Total gains	763.7903	934.1527	1094.2596	1253.7096	1361.3522	1346.4861	1287.2383	1188.3209	1075.9376	912.7903	770.5395	714.2158 (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	58.7063	58.8323	58.9564	59.5461	59.6578	60.1831	60.1831	60.2814	59.9797	59.6578	59.4324	59.1985
alpha	4.9138	4.9222	4.9304	4.9697	4.9772	5.0122	5.0122	5.0188	4.9986	4.9772	4.9622	4.9466
util living area	0.9986	0.9959	0.9876	0.9566	0.8680	0.6995	0.5310	0.5923	0.8423	0.9768	0.9967	0.9990 (86)
MIT	19.6730	19.8563	20.1376	20.4944	20.7900	20.9491	20.9895	20.9825	20.8682	20.4727	20.0019	19.6416 (87)
Th 2	19.9337	19.9357	19.9377	19.9471	19.9489	19.9571	19.9571	19.9586	19.9539	19.9489	19.9453	19.9416 (88)
util rest of house	0.9981	0.9945	0.9830	0.9402	0.8202	0.6071	0.4113	0.4689	0.7689	0.9650	0.9953	0.9987 (89)
MIT 2	18.1622	18.4311	18.8409	19.3545	19.7443	19.9236	19.9533	19.9515	19.8484	19.3337	18.6514	18.1219 (90)
Living area fraction									fLA = Living area / (4) =			0.2062 (91)
MIT	18.4738	18.7250	19.1083	19.5896	19.9600	20.1351	20.1670	20.1641	20.0587	19.5686	18.9299	18.4353 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4738	18.7250	19.1083	19.5896	19.9600	20.1351	20.1670	20.1641	20.0587	19.5686	18.9299	18.4353 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9971	0.9922	0.9781	0.9331	0.8208	0.6240	0.4361	0.4943	0.7774	0.9592	0.9933	0.9979 (94)	
Ext temp.	761.5560	926.8473	1070.3389	1169.8812	1117.3612	840.1747	561.3690	587.3963	836.3999	875.5383	765.3497	712.6973 (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	2308.0621	2246.4411	2044.4307	1716.1376	1323.5975	879.2155	566.5952	596.9273	949.7120	1437.1481	1902.8499	2298.7988 (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	1150.6005	886.7670	724.7242	393.3046	153.4398	0.0000	0.0000	0.0000	0.0000	417.8377	819.0001	1180.0595 (98)	
Space heating per m2												5725.7336 (98)	
												(98) / (4) =	41.5933 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6123.7792 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1150.6005	886.7670	724.7242	393.3046	153.4398	0.0000	0.0000	0.0000	0.0000	417.8377	819.0001	1180.0595	(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)	1230.5888	948.4139	775.1061	420.6467	164.1068	0.0000	0.0000	0.0000	0.0000	446.8852	875.9360	1262.0957	(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	219.5531	193.4800	203.1145	181.9649	178.2372	159.1431	152.7274	167.7445	167.4970	188.6927	199.6663	214.2323	(64)
Efficiency of water heater (217)m	88.5964	88.3776	87.9193	86.8178	84.4173	79.8000	79.8000	79.8000	79.8000	86.8760	88.1824	88.6731	(217)
Fuel for water heating, kWh/month	247.8125	218.9243	231.0238	209.5940	211.1382	199.4275	191.3877	210.2062	209.8959	217.1976	226.4242	241.5977	(219)
Water heating fuel used												2614.6297	(219)
Annual totals kWh/year													
Space heating fuel - main system												6123.7792	(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)												487.0745	(232)
Total delivered energy for all uses												9300.4835	(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	6123.7792	0.2160	1322.7363 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2614.6297	0.2160	564.7600 (264)
Space and water heating			1887.4963 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	487.0745	0.5190	252.7917 (268)
Total CO2, kg/m2/year			2179.2130 (272)
Emissions per m2 for space and water heating			13.7113 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.8363 (272b)
Emissions per m2 for pumps and fans			0.2828 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.7113 * 1.00) + 1.8363 + 0.2828, rounded to 2 d.p.			15.8300 (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	69.4400 (1b)	x 2.3900 (2b)	= 165.9616 (1b) - (3b)
First floor	68.2200 (1c)	x 2.6700 (2c)	= 182.1474 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.1090 (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) = 0.1149 (8)
Pressure test					Yes
Measured/design AP50					4.2000
Infiltration rate					0.3249 (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) =	0.2762 (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	0.3521	0.3452	0.3383	0.3038	0.2969	0.2624	0.2624	0.2555	0.2762	0.2969	0.3107	0.3245 (22b)
Effective ac	0.5620	0.5596	0.5572	0.5461	0.5441	0.5344	0.5344	0.5326	0.5381	0.5441	0.5483	0.5527 (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		(26a)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878		(27)
Ground Floor			69.4400	0.1100	7.6384	140.0000	9721.6000 (28a)
Brick and Block	172.9300	29.2700	143.6600	0.2400	34.4784	42.2200	6065.3252 (29a)
Pitched Roof	69.4400		69.4400	0.1000	6.9440	9.0000	624.9600 (30)
Total net area of external elements Aum(A, m ²)			311.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4806		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.9100			9.0000	485.1900 (32c)
First Floor Stud			159.7900			9.0000	1438.1100 (32c)
Internal Floor 1			68.2200			18.0000	1227.9600 (32d)
Internal Ceiling 1			68.2200			9.0000	613.9800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24401.8752 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 177.2619 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6381 (36)
Total fabric heat loss (33) + (36) = 90.1187 (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	64.5595	64.2830	64.0119	62.7388	62.5006	61.3917	61.3917	61.1863	61.8188	62.5006	62.9824	63.4862 (38)
Heat transfer coeff	154.6782	154.4017	154.1306	152.8574	152.6192	151.5103	151.5103	151.3050	151.9375	152.6192	153.1011	153.6049 (39)
Average = Sum(39)m / 12 =												152.8563 (39)
HLP	1.1236	1.1216	1.1196	1.1104	1.1087	1.1006	1.1006	1.0991	1.1037	1.1087	1.1122	1.1158 (40)
HLP (average)												1.1104 (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												2.9125 (42)
Average daily hot water use (litres/day)												103.3717 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7089	109.5740	105.4392	101.3043	97.1694	93.0345	93.0345	97.1694	101.3043	105.4392	109.5740	113.7089 (44)
Energy conte	168.6270	147.4822	152.1885	132.6816	127.3111	109.8598	101.8013	116.8185	118.2137	137.7666	150.3830	163.3062 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4396 (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	35.8332	31.3400	32.3400	28.1948	27.0536	23.3452	21.6328	24.8239	25.1204	29.2754	31.9564	34.7026 (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	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.5802	24.4965	19.9219	15.0821	11.2741	9.5180	10.2846	13.3683	17.9429	22.7826	26.5907	28.3467	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.7354	309.9184	301.8974	284.8218	263.2669	243.0083	229.4743	226.2914	234.3123	251.3879	272.9429	293.2015	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	(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)	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	(71)
Water heating gains (Table 5)	48.1630	46.6369	43.4678	39.1595	36.3624	32.4239	29.0763	33.3655	34.8894	39.3487	44.3839	46.6432	(72)
Total internal gains	449.1660	447.7391	431.9745	405.7508	377.5908	351.6377	335.5226	339.7126	353.8321	380.2066	410.6048	434.8788	(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
Northeast				0.6600	11.2829		0.6300		0.7000		0.7700		2.2758 (75)
Southeast				17.4500	36.7938		0.6300		0.7000		0.7700		196.2196 (77)
Northwest				9.0400	11.2829		0.6300		0.7000		0.7700		31.1719 (81)
Solar gains	229.6672	402.3182	579.9794	768.0859	905.4681	918.7793	877.5369	772.0075	644.6440	452.6040	277.1116	195.2381	(83)
Total gains	678.8332	850.0573	1011.9539	1173.8368	1283.0589	1270.4170	1213.0595	1111.7200	998.4761	832.8106	687.7165	630.1169	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8219	43.9004	43.9776	44.3439	44.4131	44.7382	44.7382	44.7989	44.6124	44.4131	44.2733	44.1281	
alpha	3.9215	3.9267	3.9318	3.9563	3.9609	3.9825	3.9825	3.9866	3.9742	3.9609	3.9516	3.9419	
util living area	0.9961	0.9902	0.9752	0.9324	0.8366	0.6800	0.5255	0.5860	0.8180	0.9615	0.9922	0.9971	(86)
MIT	19.2998	19.5334	19.8862	20.3247	20.6904	20.9051	20.9739	20.9601	20.7925	20.2963	19.7074	19.2561	(87)
Th 2	19.9816	19.9832	19.9848	19.9924	19.9938	20.0003	20.0003	20.0016	19.9978	19.9938	19.9909	19.9879	(88)
util rest of house	0.9951	0.9878	0.9688	0.9143	0.7930	0.5993	0.4165	0.4752	0.7536	0.9477	0.9898	0.9963	(89)
MIT 2	18.4212	18.6548	19.0049	19.4358	19.7715	19.9494	19.9914	19.9866	19.8691	19.4172	18.8350	18.3825	(90)
Living area fraction	18.6024	18.8360	19.1867	19.6191	19.9611	20.1465	20.1940	20.1874	20.0596	19.5985	19.0150	18.5627	(91)
Temperature adjustment	18.6024	18.8360	19.1867	19.6191	19.9611	20.1465	20.1940	20.1874	20.0596	19.5985	19.0150	18.5627	(92)
adjusted MIT	18.6024	18.8360	19.1867	19.6191	19.9611	20.1465	20.1940	20.1874	20.0596	19.5985	19.0150	18.5627	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	674.2424	836.5099	973.8441	1063.7851	1015.3808	777.4712	531.9452	552.5159	756.9914	783.4834	678.5699	626.8884	(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	2212.2723	2151.7448	1955.4036	1638.4947	1260.7952	840.3494	544.5347	573.0464	905.4791	1373.3393	1824.1928	2206.1778	(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	1144.2942	883.8379	730.2803	413.7909	182.5883	0.0000	0.0000	0.0000	0.0000	438.8528	824.8485	1174.9913	(98)
Space heating												5793.4842	(98)
Space heating per m2												42.0855	(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	1424.1973	1121.1766	1149.9180	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8443	0.9027	0.8741	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1202.5069	1012.1128	1005.1032	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1606.4532	1536.6165	1420.5183	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	290.8413	390.2307	309.0688	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												990.1409 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	72.7103	97.5577	77.2672	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												247.5352 (107)
Space cooling per m2												1.7982 (108)
Energy for space heating												42.0855 (99)
Energy for space cooling												1.7982 (108)
Total												43.8836 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.4400 (1b)	x 2.3900 (2b)	= 165.9616 (1b) - (3b)
First floor	68.2200 (1c)	x 2.6700 (2c)	= 182.1474 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.1090 (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) =	0.1149 (8)	
Pressure test												Yes		
Measured/design AP50												5.0000		
Infiltration rate												0.3649 (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) =	0.3102 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind factor	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)		
Adj infilt rate	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)		
	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3645 (22b)		
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664 (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 Semi-glazed door			2.1200	1.2000	2.5440			(26a)				
TER Opening Type (Uw = 1.40)			27.1500	1.3258	35.9943			(27)				
Ground Floor			69.4400	0.1300	9.0272			(28a)				
Brick and Block	172.9300	29.2700	143.6600	0.1800	25.8588			(29a)				
Pitched Roof	69.4400		69.4400	0.1300	9.0272			(30)				
Total net area of external elements Aum(A, m2)			311.8100					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		82.4515			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								13.9673 (36)				
Total fabric heat loss						(33) + (36) =		96.4188 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 66.4210	Feb 66.0722	Mar 65.7302	Apr 64.1243	May 63.8238	Jun 62.4251	Jul 62.4251	Aug 62.1661	Sep 62.9639	Oct 63.8238	Nov 64.4317	Dec 65.0671 (38)
Heat transfer coeff	162.8398	162.4910	162.1491	160.5431	160.2426	158.8439	158.8439	158.5849	159.3827	160.2426	160.8505	161.4860 (39)
Average = Sum(39)m / 12 =												160.5417 (39)
HLP	Jan 1.1829	Feb 1.1804	Mar 1.1779	Apr 1.1662	May 1.1640	Jun 1.1539	Jul 1.1539	Aug 1.1520	Sep 1.1578	Oct 1.1640	Nov 1.1685	Dec 1.1731 (40)
HLP (average)												1.1662 (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												2.9125 (42)
Average daily hot water use (litres/day)												103.3717 (43)
Daily hot water use	Jan 113.7089	Feb 109.5740	Mar 105.4392	Apr 101.3043	May 97.1694	Jun 93.0345	Jul 93.0345	Aug 97.1694	Sep 101.3043	Oct 105.4392	Nov 109.5740	Dec 113.7089 (44)
Energy conte	168.6270	147.4822	152.1885	132.6816	127.3111	109.8598	101.8013	116.8185	118.2137	137.7666	150.3830	163.3062 (45)
Energy content (annual)												Total = Sum(45)m = 1626.4396 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000 (59)
	35.8332	31.3400	32.3400	28.1948	27.0536	23.3452	21.6328	24.8239	25.1204	29.2754	31.9564	34.7026	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	145.6247	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	27.5802	24.4965	19.9219	15.0821	11.2741	9.5180	10.2846	13.3683	17.9429	22.7826	26.5907	28.3467	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	306.7354	309.9184	301.8974	284.8218	263.2669	243.0083	229.4743	226.2914	234.3123	251.3879	272.9429	293.2015	(68)
Pumps, fans	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	37.5625	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	(71)
Total internal gains	48.1630	46.6369	43.4678	39.1595	36.3624	32.4239	29.0763	33.3655	34.8894	39.3487	44.3839	46.6432	(72)
	449.1660	447.7391	431.9745	405.7508	377.5908	351.6377	335.5226	339.7126	353.8321	380.2066	410.6048	434.8788	(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		
Northeast			0.6600		11.2829		0.6300		0.7000		0.7700		2.2758 (75)
Southeast			17.4500		36.7938		0.6300		0.7000		0.7700		196.2196 (77)
Northwest			9.0400		11.2829		0.6300		0.7000		0.7700		31.1719 (81)

Solar gains	229.6672	402.3182	579.9794	768.0859	905.4681	918.7793	877.5369	772.0075	644.6440	452.6040	277.1116	195.2381	(83)
Total gains	678.8332	850.0573	1011.9539	1173.8368	1283.0589	1270.4170	1213.0595	1111.7200	998.4761	832.8106	687.7165	630.1169	(84)

7. Mean internal temperature (heating season)													

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	58.7063	58.8323	58.9564	59.5461	59.6578	60.1831	60.1831	60.2814	59.9797	59.6578	59.4324	59.1985	
util living area	4.9138	4.9222	4.9304	4.9697	4.9772	5.0122	5.0122	5.0188	4.9986	4.9772	4.9622	4.9466	
	0.9992	0.9973	0.9910	0.9659	0.8884	0.7293	0.5602	0.6266	0.8708	0.9839	0.9980	0.9994	(86)
MIT	19.6158	19.8002	20.0848	20.4499	20.7616	20.9386	20.9868	20.9776	20.8431	20.4235	19.9464	19.5847	(87)
Th 2	19.9337	19.9357	19.9377	19.9471	19.9489	19.9571	19.9571	19.9586	19.9539	19.9489	19.9453	19.9416	(88)
util rest of house													
	0.9989	0.9964	0.9877	0.9525	0.8448	0.6372	0.4356	0.4992	0.8038	0.9754	0.9972	0.9992	(89)
MIT 2	18.6671	18.8528	19.1371	19.5012	19.7870	19.9288	19.9537	19.9522	19.8651	19.4822	19.0067	18.6424	(90)
Living area fraction													
MIT	18.8627	19.0482	19.3326	19.6969	19.9880	20.1371	20.1668	20.1636	20.0668	19.6763	19.2005	18.8367	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8627	19.0482	19.3326	19.6969	19.9880	20.1371	20.1668	20.1636	20.0668	19.6763	19.2005	18.8367	(93)

8. Space heating requirement													

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9985	0.9953	0.9851	0.9484	0.8467	0.6544	0.4615	0.5256	0.8124	0.9724	0.9963	0.9989	(94)
Ext temp.	677.7951	846.0451	996.8749	1113.3236	1086.3971	831.4086	559.8441	584.3755	811.1228	809.7976	685.1638	629.4488	(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	2371.3916	2298.9472	2080.7901	1733.3640	1328.0913	879.5319	566.5617	596.8573	951.0005	1454.4155	1946.3729	2363.6216	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating	1260.0358	976.3503	806.4329	446.4290	179.8204	0.0000	0.0000	0.0000	0.0000	479.5957	908.0705	1290.2246	(98)
Space heating per m2												6346.9591	(98)
												46.1061	(99)

8c. Space cooling requirement													

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1493.1326	1175.4448	1205.2450	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8626	0.9233	0.8942	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1287.9935	1085.3155	1077.7783	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1606.4532	1536.6165	1420.5183	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	229.2909	335.7680	254.9985	0.0000	0.0000	0.0000	0.0000	(104)
												820.0574	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	57.3227	83.9420	63.7496	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												205.0144 (107)
Space cooling per m2												1.4893 (108)
Energy for space heating												46.1061 (99)
Energy for space cooling												1.4893 (108)
Total												47.5953 (109)
Target Fabric Energy Efficiency (TFEE)												54.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.4400 (1b)	x 2.3900 (2b)	= 165.9616 (1b) - (3b)
First floor	68.2200 (1c)	x 2.6700 (2c)	= 182.1474 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.1090 (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					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) = 0.1436 (8)
Pressure test					Yes
Measured/design AP50					4.2000
Infiltration rate					0.3536 (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) =	0.3006 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate	0.3156	0.2931	0.3006	0.2856	0.2856	0.2780	0.2705	0.2630	0.2555	0.2780	0.2630	0.2780 (22b)
Effective ac	0.5498	0.5429	0.5452	0.5408	0.5408	0.5387	0.5366	0.5346	0.5326	0.5387	0.5346	0.5387 (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		(26a)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878		(27)
Ground Floor			69.4400	0.1100	7.6384	140.0000	9721.6000 (28a)
Brick and Block	172.9300	29.2700	143.6600	0.2400	34.4784	42.2200	6065.3252 (29a)
Pitched Roof	69.4400		69.4400	0.1000	6.9440	9.0000	624.9600 (30)
Total net area of external elements Aum(A, m ²)			311.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4806		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.9100			9.0000	485.1900 (32c)
First Floor Stud			159.7900			9.0000	1438.1100 (32c)
Internal Floor 1			68.2200			18.0000	1227.9600 (32d)
Internal Ceiling 1			68.2200			18.0000	1227.9600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25015.8552 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7220 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6381 (36)
Total fabric heat loss (33) + (36) = 90.1187 (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	63.1596	62.3715	62.6277	62.1217	62.1217	61.8784	61.6416	61.4114	61.1876	61.8784	61.4114	61.8784 (38)
Heat transfer coeff	153.2783	152.4901	152.7464	152.2404	152.2404	151.9971	151.7603	151.5300	151.3062	151.9971	151.5300	151.9971 (39)
Average = Sum(39)m / 12 =												152.0928 (39)
HLP	1.1135	1.1077	1.1096	1.1059	1.1059	1.1041	1.1024	1.1008	1.0991	1.1041	1.1008	1.1041 (40)
HLP (average)												1.1048 (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												2.9125 (42)
Average daily hot water use (litres/day)												103.3717 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7089	109.5740	105.4392	101.3043	97.1694	93.0345	93.0345	97.1694	101.3043	105.4392	109.5740	113.7089 (44)
Energy conte	168.6270	147.4822	152.1885	132.6816	127.3111	109.8598	101.8013	116.8185	118.2137	137.7666	150.3830	163.3062 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4396 (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	25.2940	22.1223	22.8283	19.9022	19.0967	16.4790	15.2702	17.5228	17.7320	20.6650	22.5575	24.4959 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0476 (55)
Total storage loss												
32.4756	29.3328	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756 (56)
If cylinder contains dedicated solar storage												
32.4756	29.3328	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756 (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												
224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442 (62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h												
224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442 (64)	
RHI water heating demand												2282.7096 (64)
Heat gains from water heating, kWh/month												2283 (64)
100.6589	89.3130	95.1931	87.2686	86.9214	79.6804	78.4393	83.4325	82.4580	90.3978	93.1544	98.8897 (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	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	68.9504	61.2412	49.8047	37.7053	28.1852	23.7951	25.7115	33.4207	44.8572	56.9566	66.4767	70.8668 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	457.8141	462.5648	450.5932	425.1072	392.9357	362.6990	342.4990	337.7483	349.7199	375.2059	407.3774	437.6141 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875 (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)	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997 (71)
Water heating gains (Table 5)	135.2942	132.9063	127.9477	121.2064	116.8298	110.6672	105.4292	112.1405	114.5251	121.5024	129.3811	132.9163 (72)
Total internal gains	778.6960	773.3496	744.9829	700.6563	654.5879	613.7986	590.2770	599.9469	625.7395	670.3022	719.8725	758.0345 (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			
Northeast	0.6600				14.6176		0.6300		0.7000		0.7700		2.9484 (75)	
Southeast	17.4500				45.1778		0.6300		0.7000		0.7700		240.9309 (77)	
Northwest	9.0400				14.6176		0.6300		0.7000		0.7700		40.3848 (81)	
Solar gains	284.2642	424.7426	620.4077	832.4802	937.3373	1035.0132	980.0828	880.2589	730.3283	516.3764	342.0484	237.4472	(83)	
Total gains	1062.9602	1198.0922	1365.3906	1533.1364	1591.9252	1648.8119	1570.3598	1480.2057	1356.0677	1186.6786	1061.9209	995.4817	(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	45.3348	45.5692	45.4927	45.6439	45.6439	45.7170	45.7883	45.8579	45.9257	45.7170	45.8579	45.7170
alpha	4.0223	4.0379	4.0328	4.0429	4.0429	4.0478	4.0526	4.0572	4.0617	4.0478	4.0572	4.0478
util living area												
	0.9805	0.9685	0.9339	0.8511	0.7113	0.5063	0.3724	0.3934	0.6430	0.8751	0.9616	0.9839 (86)
MIT	19.7490	19.9159	20.2417	20.6079	20.8579	20.9722	20.9937	20.9924	20.9284	20.6300	20.1516	19.7226 (87)
Th 2	19.9899	19.9945	19.9930	19.9960	19.9960	19.9974	19.9989	20.0002	20.0015	19.9974	20.0002	19.9974 (88)
util rest of house												
	0.9758	0.9612	0.9186	0.8179	0.6519	0.4246	0.2790	0.2954	0.5607	0.8385	0.9510	0.9800 (89)
MIT 2	18.8704	19.0375	19.3514	19.6937	19.9051	19.9852	19.9972	19.9982	19.9648	19.7233	19.2753	18.8506 (90)
Living area fraction												
									fLA = Living area / (4) =			0.2062 (91)
MIT	19.0516	19.2186	19.5350	19.8822	20.1016	20.1888	20.2028	20.2033	20.1635	19.9103	19.4560	19.0305 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0516	19.2186	19.5350	19.8822	20.1016	20.1888	20.2028	20.2033	20.1635	19.9103	19.4560	19.0305 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9702	0.9542	0.9103	0.8137	0.6586	0.4407	0.2983	0.3156	0.5749	0.8349	0.9438	0.9751 (94)
Useful gains	1031.3147	1143.1703	1242.8640	1247.5590	1048.4221	726.5754	468.3673	467.1684	779.5917	990.7255	1002.2311	970.6506 (95)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000 (96)
Heat loss rate W												
	2169.1325	2122.4538	1914.6807	1580.5943	1157.2686	743.0807	470.8747	470.2382	826.6622	1293.5433	1751.0832	2132.5915 (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												
	846.5365	658.0785	499.8316	239.7854	80.9818	0.0000	0.0000	0.0000	0.0000	225.2965	539.1735	864.4840 (98)
Space heating												3954.1678 (98)
RHI space heating demand												3954 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.4400 (1b)	x 2.3900 (2b)	= 165.9616 (1b) - (3b)
First floor	68.2200 (1c)	x 2.6700 (2c)	= 182.1474 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.1090 (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) = 0.1436 (8)
Pressure test					Yes
Measured/design AP50					4.2000
Infiltration rate					0.3536 (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) =	0.3006 (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	0.3832	0.3757	0.3682	0.3306	0.3231	0.2856	0.2856	0.2780	0.3006	0.3231	0.3382	0.3532 (22b)
Effective ac	0.5734	0.5706	0.5678	0.5547	0.5522	0.5408	0.5408	0.5387	0.5452	0.5522	0.5572	0.5624 (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		(26a)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878		(27)
Ground Floor			69.4400	0.1100	7.6384	140.0000	9721.6000 (28a)
Brick and Block	172.9300	29.2700	143.6600	0.2400	34.4784	42.2200	6065.3252 (29a)
Pitched Roof	69.4400		69.4400	0.1000	6.9440	9.0000	624.9600 (30)
Total net area of external elements Aum(A, m ²)			311.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4806		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.9100			9.0000	485.1900 (32c)
First Floor Stud			159.7900			9.0000	1438.1100 (32c)
Internal Floor 1			68.2200			18.0000	1227.9600 (32d)
Internal Ceiling 1			68.2200			18.0000	1227.9600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25015.8552 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7220 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6381 (36)
Total fabric heat loss (33) + (36) = 90.1187 (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	65.8745	65.5469	65.2258	63.7175	63.4353	62.1217	62.1217	61.8784	62.6277	63.4353	64.0062	64.6030 (38)
Heat transfer coeff	155.9932	155.6656	155.3445	153.8362	153.5540	152.2404	152.2404	151.9971	152.7464	153.5540	154.1249	154.7217 (39)
Average = Sum(39)m / 12 =												153.8349 (39)
HLP	1.1332	1.1308	1.1285	1.1175	1.1155	1.1059	1.1059	1.1041	1.1096	1.1155	1.1196	1.1239 (40)
HLP (average)												1.1175 (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												2.9125 (42)
Average daily hot water use (litres/day)												103.3717 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7089	109.5740	105.4392	101.3043	97.1694	93.0345	93.0345	97.1694	101.3043	105.4392	109.5740	113.7089 (44)
Energy conte	168.6270	147.4822	152.1885	132.6816	127.3111	109.8598	101.8013	116.8185	118.2137	137.7666	150.3830	163.3062 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4396 (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	25.2940	22.1223	22.8283	19.9022	19.0967	16.4790	15.2702	17.5228	17.7320	20.6650	22.5575	24.4959 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0476 (55)
Total storage loss												
32.4756	29.3328	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756	31.4280	32.4756	31.4280	32.4756	(56)
If cylinder contains dedicated solar storage												
32.4756	29.3328	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756	31.4280	32.4756	31.4280	32.4756	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442 (62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)	
							Solar input (sum of months) =	Sum(63)m =			0.0000 (63)	
Output from w/h												
224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442 (64)	
							Total per year (kWh/year) =	Sum(64)m =			2282.7096 (64)	
Heat gains from water heating, kWh/month												
100.6589	89.3130	95.1931	87.2686	86.9214	79.6804	78.4393	83.4325	82.4580	90.3978	93.1544	98.8897 (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	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	68.9504	61.2412	49.8047	37.7053	28.1852	23.7951	25.7115	33.4207	44.8572	56.9566	66.4767	70.8668 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	457.8141	462.5648	450.5932	425.1072	392.9357	362.6990	342.4990	337.7483	349.7199	375.2059	407.3774	437.6141 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875 (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)	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997 (71)
Water heating gains (Table 5)	135.2942	132.9063	127.9477	121.2064	116.8298	110.6672	105.4292	112.1405	114.5251	121.5024	129.3811	132.9163 (72)
Total internal gains	778.6960	773.3496	744.9829	700.6563	654.5879	613.7986	590.2770	599.9469	625.7395	670.3022	719.8725	758.0345 (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
Northeast					0.6600	11.2829		0.6300	0.7000	0.7700		2.2758 (75)
Southeast					17.4500	36.7938		0.6300	0.7000	0.7700		196.2196 (77)
Northwest					9.0400	11.2829		0.6300	0.7000	0.7700		31.1719 (81)
Solar gains	229.6672	402.3182	579.9794	768.0859	905.4681	918.7793	877.5369	772.0075	644.6440	452.6040	277.1116	195.2381 (83)
Total gains	1008.3633	1175.6678	1324.9622	1468.7422	1560.0561	1532.5779	1467.8138	1371.9544	1270.3835	1122.9062	996.9841	953.2726 (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	44.5458	44.6396	44.7319	45.1704	45.2534	45.6439	45.6439	45.7170	45.4927	45.2534	45.0858	44.9119	
alpha	3.9697	3.9760	3.9821	4.0114	4.0169	4.0429	4.0429	4.0478	4.0328	4.0169	4.0057	3.9941	
util living area	0.9857	0.9732	0.9464	0.8827	0.7638	0.5944	0.4458	0.4927	0.7204	0.9130	0.9745	0.9884 (86)	
MIT	19.5927	19.8096	20.1268	20.5046	20.7926	20.9443	20.9863	20.9796	20.8781	20.4985	19.9741	19.5494 (87)	
Th 2	19.9738	19.9758	19.9777	19.9866	19.9882	19.9960	19.9960	19.9974	19.9930	19.9882	19.9849	19.9813 (88)	
util rest of house	0.9823	0.9670	0.9339	0.8554	0.7121	0.5151	0.3489	0.3927	0.6461	0.8866	0.9675	0.9856 (89)	
MIT 2	18.7033	18.9183	19.2288	19.5928	19.8464	19.9679	19.9916	19.9904	19.9233	19.5970	19.0899	18.6664 (90)	
Living area fraction									fLA = Living area / (4) =				0.2062 (91)
MIT	18.8868	19.1021	19.4140	19.7808	20.0415	20.1692	20.1968	20.1944	20.1202	19.7829	19.2722	18.8485 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.8868	19.1021	19.4140	19.7808	20.0415	20.1692	20.1968	20.1944	20.1202	19.7829	19.2722	18.8485 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9776	0.9603	0.9255	0.8491	0.7151	0.5295	0.3687	0.4130	0.6563	0.8802	0.9611	0.9815 (94)
Useful gains	985.7720	1128.9543	1226.2228	1247.0829	1115.5953	811.4302	541.1573	566.5952	833.7039	988.3670	958.2214	935.6659 (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												
	2275.4343	2210.7800	2006.1201	1673.8680	1280.8747	847.8641	547.5754	576.7389	919.5628	1410.0716	1876.0434	2266.4378 (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												
	959.5088	726.9869	580.2436	307.2853	122.9679	0.0000	0.0000	0.0000	0.0000	313.7482	660.8319	990.0943 (98)
Space heating												4661.6668 (98)
Space heating per m2										(98) / (4) =		33.8636 (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 %)													90.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5133.9943 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	959.5088	726.9869	580.2436	307.2853	122.9679	0.0000	0.0000	0.0000	0.0000	313.7482	660.8319	990.0943	(98)
Space heating efficiency (main heating system 1)	90.8000	90.8000	90.8000	90.8000	90.8000	0.0000	0.0000	0.0000	0.0000	90.8000	90.8000	90.8000	(210)
Space heating fuel (main heating system)	1056.7277	800.6464	639.0348	338.4199	135.4272	0.0000	0.0000	0.0000	0.0000	345.5377	727.7884	1090.4122	(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	224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442	(64)
Efficiency of water heater (217)m	88.5580	88.2775	87.7091	86.4372	84.0815	80.1000	80.1000	80.1000	80.1000	86.3973	88.0230	80.1000	(216)
Fuel for water heating, kWh/month	253.3536	224.0959	237.0638	215.9043	217.7045	204.4942	196.6783	215.4263	214.9234	223.9707	232.1245	247.0760	(219)
Water heating fuel used												2682.8155	(219)
Annual totals kWh/year													
Space heating fuel - main system												5133.9943	(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)												487.0745	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.30 * 1029 * 1.00) =										-1070.3542		-1070.3542	(233)
Total delivered energy for all uses												7308.5301	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5133.9943	3.4800	178.6630 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2682.8155	3.4800	93.3620 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	487.0745	13.1900	64.2451 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1070.3542	13.1900	-141.1797 (252)
Total energy cost			324.9829 (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] =	0.7473 (257)
SAP value		89.5759
SAP rating (Section 12)		90 (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	5133.9943	0.2160	1108.9428 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2682.8155	0.2160	579.4881 (264)
Space and water heating			1688.4309 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	487.0745	0.5190	252.7917 (268)
Energy saving/generation technologies			
PV Unit	-1070.3542	0.5190	-555.5138 (269)
Total kg/year			1424.6338 (272)
CO2 emissions per m2			10.3500 (273)
EI value			89.5488
EI rating			90 (274)
EI band			B

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Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9080 = 3.833$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9080 = 0.2379$, stars = 4
Water heating energy efficiency	$3.48 / 0.8488 = 4.100$, stars = 4
Water heating environmental impact	$0.216 / 0.8488 = 0.2545$, 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	69.4400 (1b)	x 2.3900 (2b)	= 165.9616 (1b) - (3b)
First floor	68.2200 (1c)	x 2.6700 (2c)	= 182.1474 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.1090 (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) = 0.1436 (8)
Pressure test					Yes
Measured/design AP50					4.2000
Infiltration rate					0.3536 (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) =	0.3006 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate	0.3156	0.2931	0.3006	0.2856	0.2856	0.2780	0.2705	0.2630	0.2555	0.2780	0.2630	0.2780 (22b)
Effective ac	0.5498	0.5429	0.5452	0.5408	0.5408	0.5387	0.5366	0.5346	0.5326	0.5387	0.5346	0.5387 (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		(26a)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878		(27)
Ground Floor			69.4400	0.1100	7.6384	140.0000	9721.6000 (28a)
Brick and Block	172.9300	29.2700	143.6600	0.2400	34.4784	42.2200	6065.3252 (29a)
Pitched Roof	69.4400		69.4400	0.1000	6.9440	9.0000	624.9600 (30)
Total net area of external elements Aum(A, m ²)			311.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4806		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.9100			9.0000	485.1900 (32c)
First Floor Stud			159.7900			9.0000	1438.1100 (32c)
Internal Floor 1			68.2200			18.0000	1227.9600 (32d)
Internal Ceiling 1			68.2200			18.0000	1227.9600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25015.8552 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7220 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6381 (36)
Total fabric heat loss (33) + (36) = 90.1187 (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	63.1596	62.3715	62.6277	62.1217	62.1217	61.8784	61.6416	61.4114	61.1876	61.8784	61.4114	61.8784 (38)
Heat transfer coeff	153.2783	152.4901	152.7464	152.2404	152.2404	151.9971	151.7603	151.5300	151.3062	151.9971	151.5300	151.9971 (39)
Average = Sum(39)m / 12 =												152.0928 (39)
HLP	1.1135	1.1077	1.1096	1.1059	1.1059	1.1041	1.1024	1.1008	1.0991	1.1041	1.1008	1.1041 (40)
HLP (average)												1.1048 (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												2.9125 (42)
Average daily hot water use (litres/day)												103.3717 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7089	109.5740	105.4392	101.3043	97.1694	93.0345	93.0345	97.1694	101.3043	105.4392	109.5740	113.7089 (44)
Energy conte	168.6270	147.4822	152.1885	132.6816	127.3111	109.8598	101.8013	116.8185	118.2137	137.7666	150.3830	163.3062 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4396 (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	25.2940	22.1223	22.8283	19.9022	19.0967	16.4790	15.2702	17.5228	17.7320	20.6650	22.5575	24.4959 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0476 (55)
Total storage loss												
32.4756	29.3328	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756	31.4280	32.4756	31.4280	32.4756	(56)
If cylinder contains dedicated solar storage												
32.4756	29.3328	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756	31.4280	32.4756	31.4280	32.4756	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442 (64)
Total per year (kWh/year) = Sum(64)m =												2282.7096 (64)
Heat gains from water heating, kWh/month												
100.6589	89.3130	95.1931	87.2686	86.9214	79.6804	78.4393	83.4325	82.4580	90.3978	93.1544	98.8897	(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	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
68.9504	61.2412	49.8047	37.7053	28.1852	23.7951	25.7115	33.4207	44.8572	56.9566	66.4767	70.8668	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
457.8141	462.5648	450.5932	425.1072	392.9357	362.6990	342.4990	337.7483	349.7199	375.2059	407.3774	437.6141	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	(71)
Water heating gains (Table 5)												
135.2942	132.9063	127.9477	121.2064	116.8298	110.6672	105.4292	112.1405	114.5251	121.5024	129.3811	132.9163	(72)
Total internal gains	778.6960	773.3496	744.9829	700.6563	654.5879	613.7986	590.2770	599.9469	625.7395	670.3022	719.8725	758.0345 (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	
Northeast				0.6600	14.6176		0.6300	0.7000	0.7700		2.9484 (75)	
Southeast				17.4500	45.1778		0.6300	0.7000	0.7700		240.9309 (77)	
Northwest				9.0400	14.6176		0.6300	0.7000	0.7700		40.3848 (81)	
Solar gains	284.2642	424.7426	620.4077	832.4802	937.3373	1035.0132	980.0828	880.2589	730.3283	516.3764	342.0484	237.4472 (83)
Total gains	1062.9602	1198.0922	1365.3906	1533.1364	1591.9252	1648.8119	1570.3598	1480.2057	1356.0677	1186.6786	1061.9209	995.4817 (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	45.3348	45.5692	45.4927	45.6439	45.6439	45.7170	45.7883	45.8579	45.9257	45.7170	45.8579	45.7170
alpha	4.0223	4.0379	4.0328	4.0429	4.0429	4.0478	4.0526	4.0572	4.0617	4.0478	4.0572	4.0478
util living area	0.9805	0.9685	0.9339	0.8511	0.7113	0.5063	0.3724	0.3934	0.6430	0.8751	0.9616	0.9839 (86)
MIT	19.7490	19.9159	20.2417	20.6079	20.8579	20.9722	20.9937	20.9924	20.9284	20.6300	20.1516	19.7226 (87)
Th 2	19.9899	19.9945	19.9930	19.9960	19.9960	19.9974	19.9989	20.0002	20.0015	19.9974	20.0002	19.9974 (88)
util rest of house	0.9758	0.9612	0.9186	0.8179	0.6519	0.4246	0.2790	0.2954	0.5607	0.8385	0.9510	0.9800 (89)
MIT 2	18.8704	19.0375	19.3514	19.6937	19.9051	19.9852	19.9972	19.9982	19.9648	19.7233	19.2753	18.8506 (90)
Living area fraction									fLA = Living area / (4) =			0.2062 (91)
MIT	19.0516	19.2186	19.5350	19.8822	20.1016	20.1888	20.2028	20.2033	20.1635	19.9103	19.4560	19.0305 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0516	19.2186	19.5350	19.8822	20.1016	20.1888	20.2028	20.2033	20.1635	19.9103	19.4560	19.0305 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9702	0.9542	0.9103	0.8137	0.6586	0.4407	0.2983	0.3156	0.5749	0.8349	0.9438	0.9751 (94)
Useful gains	1031.3147	1143.1703	1242.8640	1247.5590	1048.4221	726.5754	468.3673	467.1684	779.5917	990.7255	1002.2311	970.6506 (95)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000 (96)
Heat loss rate W	2169.1325	2122.4538	1914.6807	1580.5943	1157.2686	743.0807	470.8747	470.2382	826.6622	1293.5433	1751.0832	2132.5915 (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	846.5365	658.0785	499.8316	239.7854	80.9818	0.0000	0.0000	0.0000	0.0000	225.2965	539.1735	864.4840 (98)
Space heating												3954.1678 (98)
Space heating per m2												(98) / (4) = 28.7242 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4354.8103 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	846.5365	658.0785	499.8316	239.7854	80.9818	0.0000	0.0000	0.0000	0.0000	225.2965	539.1735	864.4840	(98)
Space heating efficiency (main heating system 1)	90.8000	90.8000	90.8000	90.8000	90.8000	0.0000	0.0000	0.0000	0.0000	90.8000	90.8000	90.8000	(210)
Space heating fuel (main heating system)	932.3089	724.7561	550.4753	264.0808	89.1870	0.0000	0.0000	0.0000	0.0000	248.1238	593.8034	952.0749	(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	224.3650	197.8262	207.9265	186.6216	183.0491	163.7998	157.5393	172.5565	172.1537	193.5046	204.3230	219.0442	(64)
Efficiency of water heater (217)m	88.3280	88.0805	87.3712	85.7847	83.1037	80.1000	80.1000	80.1000	80.1000	85.5215	87.5847	80.1000	(216)
Fuel for water heating, kWh/month	254.0136	224.5971	237.9806	217.5465	220.2661	204.4942	196.6783	215.4263	214.9234	226.2643	233.2862	247.7528	(219)
Water heating fuel used												2693.2292	(219)
Annual totals kWh/year													
Space heating fuel - main system												4354.8103	(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)												487.0745	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.30 * 1156 * 1.00) =										-1202.4799		-1202.4799	(233)
Total delivered energy for all uses												6407.6342	(238)

10a. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4354.8103	10.2300	445.4971 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2693.2292	10.2300	275.5173 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	487.0745	36.7200	178.8538 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-1202.4799	36.7200	-441.5506 (252)
Total energy cost			588.8576 (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	4354.8103	0.2160	940.6390 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2693.2292	0.2160	581.7375 (264)
Space and water heating			1522.3765 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	487.0745	0.5190	252.7917 (268)
Energy saving/generation technologies			
PV Unit	-1202.4799	0.5190	-624.0871 (269)
Total kg/year			1190.0062 (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	4354.8103	1.2200	5312.8686 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2693.2292	1.2200	3285.7397 (264)
Space and water heating			8598.6082 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	487.0745	3.0700	1495.3189 (268)
Energy saving/generation technologies			
PV Unit	-1202.4799	3.0700	-3691.6133 (269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Primary energy kWh/year
Primary energy kWh/m²/year

6632.5638 (272)
48.1808 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 90
Current environmental impact rating: B 90

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E	Low energy lighting
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	Recommended
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
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
L2	Not applicable
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 124	-275 kg (23.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£124 2.00 kg/m ²	B 91	B 91
Total Savings	£124 2.00 kg/m ²		

Potential energy efficiency rating: B 91
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 533 TEST (30 Nov 2023)
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	£206	£225	-£18
Mains gas	£824	£681	£143
Space heating	£576	£581	-£5
Water heating	£276	£146	£130
Lighting	£179	£179	£0
Generated (PV)	-£442	-£442	£0
Total cost of fuels	£588	£464	£125
Total cost of uses	£589	£464	£125
Delivered energy	47 kWh/m ²	37 kWh/m ²	10 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	0.9 tonnes	0.3 tonnes
CO2 emissions per m ²	9 kg/m ²	7 kg/m ²	2 kg/m ²
Primary energy	48 kWh/m ²	37 kWh/m ²	11 kWh/m ²

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	69.4400 (1b)	x 2.3900 (2b)	= 165.9616 (1b) - (3b)
First floor	68.2200 (1c)	x 2.6700 (2c)	= 182.1474 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.1090 (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) = 0.1436 (8)
Pressure test					Yes
Measured/design AP50					4.2000
Infiltration rate					0.3536 (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) =	0.3006 (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	0.3832	0.3757	0.3682	0.3306	0.3231	0.2856	0.2856	0.2780	0.3006	0.3231	0.3382	0.3532 (22b)
Effective ac	0.5734	0.5706	0.5678	0.5547	0.5522	0.5408	0.5408	0.5387	0.5452	0.5522	0.5572	0.5624 (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		(26a)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878		(27)
Ground Floor			69.4400	0.1100	7.6384	140.0000	9721.6000 (28a)
Brick and Block	172.9300	29.2700	143.6600	0.2400	34.4784	42.2200	6065.3252 (29a)
Pitched Roof	69.4400		69.4400	0.1000	6.9440	9.0000	624.9600 (30)
Total net area of external elements Aum(A, m ²)			311.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4806		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.9100			9.0000	485.1900 (32c)
First Floor Stud			159.7900			9.0000	1438.1100 (32c)
Internal Floor 1			68.2200			18.0000	1227.9600 (32d)
Internal Ceiling 1			68.2200			18.0000	1227.9600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25015.8552 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7220 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6381 (36)
Total fabric heat loss (33) + (36) = 90.1187 (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	65.8745	65.5469	65.2258	63.7175	63.4353	62.1217	62.1217	61.8784	62.6277	63.4353	64.0062	64.6030 (38)
Heat transfer coeff	155.9932	155.6656	155.3445	153.8362	153.5540	152.2404	152.2404	151.9971	152.7464	153.5540	154.1249	154.7217 (39)
Average = Sum(39)m / 12 =												153.8349 (39)
HLP	1.1332	1.1308	1.1285	1.1175	1.1155	1.1059	1.1059	1.1041	1.1096	1.1155	1.1196	1.1239 (40)
HLP (average)												1.1175 (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												2.9125 (42)
Average daily hot water use (litres/day)												103.3717 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7089	109.5740	105.4392	101.3043	97.1694	93.0345	93.0345	97.1694	101.3043	105.4392	109.5740	113.7089 (44)
Energy conte	168.6270	147.4822	152.1885	132.6816	127.3111	109.8598	101.8013	116.8185	118.2137	137.7666	150.3830	163.3062 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4396 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.2940	22.1223	22.8283	19.9022	19.0967	16.4790	15.2702	17.5228	17.7320	20.6650	22.5575	24.4959 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0476 (55)
Total storage loss												
32.4756	29.3328	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756	31.4280	32.4756	31.4280	32.4756	(56)
If cylinder contains dedicated solar storage												
20.2973	18.3330	20.2973	19.6425	20.2973	19.6425	20.2973	20.2973	19.6425	20.2973	19.6425	20.2973	(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												
212.1866	186.8264	194.3524	168.0825	158.0765	139.4076	132.3340	148.2817	154.9653	179.9305	192.5375	206.8659 (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												1.1151 (H8)
Utilisation factor												0.5921 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												112.5000 (H13)
Daily hot water demand												103.3717 (H14)
Volume ratio Veff/V												1.0883 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-944.2587 (H17)
Solar input	-27.3816	-45.6921	-77.8188	-104.2925	-128.8446	-126.6748	-125.0007	-109.2138	-85.5363	-58.4112	-32.4785	-22.9137 (63)
Solar input (sum of months) = Sum(63)m =												-944.2587 (63)
Output from w/h												
184.8050	141.1344	116.5336	63.7900	29.2318	12.7328	7.3333		39.0679	69.4290	121.5193	160.0590	183.9521 (64)
Total per year (kWh/year) = Sum(64)m =												1129.5882 (64)
Heat gains from water heating, kWh/month												
90.9162	80.5132	84.3338	72.4374	66.9432	60.1666	58.2751	64.0127	68.7073	79.5385	83.7260	89.1470 (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	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	68.9504	61.2412	49.8047	37.7053	28.1852	23.7951	25.7115	33.4207	44.8572	56.9566	66.4767	70.8668 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	457.8141	462.5648	450.5932	425.1072	392.9357	362.6990	342.4990	337.7483	349.7199	375.2059	407.3774	437.6141 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875 (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)												
	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997 (71)
Water heating gains (Table 5)												
	122.1992	119.8113	113.3519	100.6074	89.9774	83.5648	78.3267	86.0386	95.4269	106.9066	116.2861	119.8213 (72)
Total internal gains												
	765.6010	760.2546	730.3871	680.0573	627.7356	586.6961	563.1745	573.8449	606.6413	655.7064	706.7775	744.9395 (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
Northeast					0.6600	11.2829		0.6300	0.7000	0.7700		2.2758 (75)
Southeast					17.4500	36.7938		0.6300	0.7000	0.7700		196.2196 (77)
Northwest					9.0400	11.2829		0.6300	0.7000	0.7700		31.1719 (81)
Solar gains	229.6672	402.3182	579.9794	768.0859	905.4681	918.7793	877.5369	772.0075	644.6440	452.6040	277.1116	195.2381 (83)
Total gains	995.2683	1162.5728	1310.3664	1448.1432	1533.2037	1505.4754	1440.7114	1345.8524	1251.2853	1108.3104	983.8891	940.1776 (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	44.5458	44.6396	44.7319	45.1704	45.2534	45.6439	45.6439	45.7170	45.4927	45.2534	45.0858	44.9119
alpha	3.9697	3.9760	3.9821	4.0114	4.0169	4.0429	4.0429	4.0478	4.0328	4.0169	4.0057	3.9941
util living area												
	0.9863	0.9741	0.9481	0.8867	0.7713	0.6029	0.4535	0.5012	0.7274	0.9160	0.9756	0.9889 (86)
MIT	19.5819	19.7994	20.1167	20.4938	20.7846	20.9414	20.9854	20.9783	20.8737	20.4897	19.9638	19.5385 (87)
Th 2	19.9738	19.9758	19.9777	19.9866	19.9882	19.9960	19.9960	19.9974	19.9930	19.9882	19.9849	19.9813 (88)
util rest of house												
	0.9831	0.9681	0.9359	0.8601	0.7201	0.5232	0.3552	0.3999	0.6533	0.8902	0.9688	0.9863 (89)
MIT 2	18.6928	18.9084	19.2192	19.5833	19.8404	19.9663	19.9914	19.9899	19.9204	19.5892	19.0799	18.6556 (90)
Living area fraction									fLA = Living area / (4) =			0.2062 (91)
MIT	18.8761	19.0921	19.4043	19.7710	20.0351	20.1674	20.1964	20.1938	20.1170	19.7749	19.2622	18.8377 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8761	19.0921	19.4043	19.7710	20.0351	20.1674	20.1964	20.1938	20.1170	19.7749	19.2622	18.8377 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9785	0.9615	0.9276	0.8536	0.7227	0.5375	0.3753	0.4204	0.6632	0.8837	0.9626	0.9823	(94)
Useful gains	973.8521	1117.8454	1215.4660	1236.0817	1108.0755	809.1524	540.6685	565.8252	829.8971	979.4636	947.0780	923.5561	(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	2273.7788	2209.2293	2004.6154	1672.3605	1279.8887	847.5792	547.5125	576.6409	919.0735	1408.8450	1874.5002	2264.7697	(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	967.1455	733.4100	587.1271	314.1207	127.8290	0.0000	0.0000	0.0000	0.0000	319.4597	667.7440	997.8629	(98)
Space heating												4714.6990	(98)
Space heating per m2												34.2489	(99)
												(98) / (4) =	

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5192.3997 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	967.1455	733.4100	587.1271	314.1207	127.8290	0.0000	0.0000	0.0000	0.0000	319.4597	667.7440	997.8629	(98)
Space heating efficiency (main heating system 1)	90.8000	90.8000	90.8000	90.8000	90.8000	0.0000	0.0000	0.0000	0.0000	90.8000	90.8000	90.8000	(210)
Space heating fuel (main heating system)	1065.1382	807.7203	646.6158	345.9480	140.7808	0.0000	0.0000	0.0000	0.0000	351.8279	735.4008	1098.9679	(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	184.8050	141.1344	116.5336	63.7900	29.2318	12.7328	7.3333	39.0679	69.4290	121.5193	160.0590	183.9521	(64)
Efficiency of water heater (217)m	88.8949	88.8839	88.8347	88.7978	88.5973	80.1000	80.1000	80.1000	80.1000	87.5762	88.5138	88.9505	(216)
Fuel for water heating, kWh/month	207.8915	158.7852	131.1802	71.8374	32.9941	15.8962	9.1551	48.7739	86.6779	138.7583	180.8294	206.8028	(219)
Water heating fuel used												1289.5820	(219)
Annual totals kWh/year													
Space heating fuel - main system												5192.3997	(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)												487.0745	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.30 * 1029 * 1.00) =										-1070.3542		-1070.3542	(233)
Total delivered energy for all uses												6023.7021	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5192.3997	3.4800	180.6955	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1289.5820	3.4800	44.8775	(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	487.0745	13.1900	64.2451	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1070.3542	13.1900	-141.1797	(252)
Total energy cost			285.1259	(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] =	0.6556 (257)
SAP value			90.8543
SAP rating (Section 12)			91 (258)
SAP band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5192.3997	0.2160	1121.5583 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1289.5820	0.2160	278.5497 (264)
Space and water heating			1400.1080 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	487.0745	0.5190	252.7917 (268)
Energy saving/generation technologies			
PV Unit	-1070.3542	0.5190	-555.5138 (269)
Total kg/year			1162.2609 (272)
CO2 emissions per m2			8.4400 (273)
EI value			91.4736
EI rating			91 (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	69.4400 (1b)	x 2.3900 (2b)	= 165.9616 (1b) - (3b)
First floor	68.2200 (1c)	x 2.6700 (2c)	= 182.1474 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.1090 (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) = 0.1436 (8)
Pressure test					Yes
Measured/design AP50					4.2000
Infiltration rate					0.3536 (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) =	0.3006 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate	0.3156	0.2931	0.3006	0.2856	0.2856	0.2780	0.2705	0.2630	0.2555	0.2780	0.2630	0.2780 (22b)
Effective ac	0.5498	0.5429	0.5452	0.5408	0.5408	0.5387	0.5366	0.5346	0.5326	0.5387	0.5346	0.5387 (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		(26a)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878		(27)
Ground Floor			69.4400	0.1100	7.6384	140.0000	9721.6000 (28a)
Brick and Block	172.9300	29.2700	143.6600	0.2400	34.4784	42.2200	6065.3252 (29a)
Pitched Roof	69.4400		69.4400	0.1000	6.9440	9.0000	624.9600 (30)
Total net area of external elements Aum(A, m ²)			311.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4806		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.9100			9.0000	485.1900 (32c)
First Floor Stud			159.7900			9.0000	1438.1100 (32c)
Internal Floor 1			68.2200			18.0000	1227.9600 (32d)
Internal Ceiling 1			68.2200			18.0000	1227.9600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25015.8552 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7220 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6381 (36)
Total fabric heat loss (33) + (36) = 90.1187 (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	63.1596	62.3715	62.6277	62.1217	62.1217	61.8784	61.6416	61.4114	61.1876	61.8784	61.4114	61.8784 (38)
Heat transfer coeff	153.2783	152.4901	152.7464	152.2404	152.2404	151.9971	151.7603	151.5300	151.3062	151.9971	151.5300	151.9971 (39)
Average = Sum(39)m / 12 =												152.0928 (39)
HLP	1.1135	1.1077	1.1096	1.1059	1.1059	1.1041	1.1024	1.1008	1.0991	1.1041	1.1008	1.1041 (40)
HLP (average)												1.1048 (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												2.9125 (42)
Average daily hot water use (litres/day)												103.3717 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7089	109.5740	105.4392	101.3043	97.1694	93.0345	93.0345	97.1694	101.3043	105.4392	109.5740	113.7089 (44)
Energy conte	168.6270	147.4822	152.1885	132.6816	127.3111	109.8598	101.8013	116.8185	118.2137	137.7666	150.3830	163.3062 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4396 (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	25.2940	22.1223	22.8283	19.9022	19.0967	16.4790	15.2702	17.5228	17.7320	20.6650	22.5575	24.4959 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0476 (55)
Total storage loss												
32.4756	29.3328	32.4756	31.4280	32.4756	31.4280	32.4756	32.4756	31.4280	32.4756	31.4280	32.4756	(56)
If cylinder contains dedicated solar storage												
20.2973	18.3330	20.2973	19.6425	20.2973	19.6425	20.2973	20.2973	19.6425	20.2973	19.6425	20.2973	(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												
212.1866	186.8264	194.3524	168.0825	158.0765	139.4076	132.3340	148.2817	154.9653	179.9305	192.5375	206.8659 (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												1208.1510 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2029.6937 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2479 (H8)
Utilisation factor												0.5513 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												112.5000 (H13)
Daily hot water demand												103.3717 (H14)
Volume ratio Veff/V												1.0883 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-983.8406 (H17)
Solar input	-32.0953	-45.6374	-78.4397	-105.8334	-124.3077	-132.7802	-129.9878	-116.3431	-91.0886	-62.9755	-37.9602	-26.3916 (63)
												Solar input (sum of months) = Sum(63)m = -983.8406 (63)
Output from w/h												
180.0914	141.1890	115.9126	62.2491	33.7688	6.6274	2.3462		31.9386	63.8767	116.9550	154.5773	180.4742 (64)
												Total per year (kWh/year) = Sum(64)m = 1090.0064 (64)
Heat gains from water heating, kWh/month												
90.9162	80.5132	84.3338	72.4374	66.9432	60.1666	58.2751	64.0127	68.7073	79.5385	83.7260	89.1470 (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	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496	174.7496 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	68.9504	61.2412	49.8047	37.7053	28.1852	23.7951	25.7115	33.4207	44.8572	56.9566	66.4767	70.8668 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	457.8141	462.5648	450.5932	425.1072	392.9357	362.6990	342.4990	337.7483	349.7199	375.2059	407.3774	437.6141 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875	55.3875 (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)												
	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997	-116.4997 (71)
Water heating gains (Table 5)												
	122.1992	119.8113	113.3519	100.6074	89.9774	83.5648	78.3267	86.0386	95.4269	106.9066	116.2861	119.8213 (72)
Total internal gains												
	765.6010	760.2546	730.3871	680.0573	627.7356	586.6961	563.1745	573.8449	606.6413	655.7064	706.7775	744.9395 (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
Northeast					0.6600	14.6176		0.6300	0.7000	0.7700		2.9484 (75)
Southeast					17.4500	45.1778		0.6300	0.7000	0.7700		240.9309 (77)
Northwest					9.0400	14.6176		0.6300	0.7000	0.7700		40.3848 (81)

Solar gains	284.2642	424.7426	620.4077	832.4802	937.3373	1035.0132	980.0828	880.2589	730.3283	516.3764	342.0484	237.4472 (83)
Total gains	1049.8652	1184.9972	1350.7948	1512.5374	1565.0729	1621.7094	1543.2573	1454.1038	1336.9695	1172.0828	1048.8259	982.3867 (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	45.3348	45.5692	45.4927	45.6439	45.6439	45.7170	45.7883	45.8579	45.9257	45.7170	45.8579	45.7170
alpha	4.0223	4.0379	4.0328	4.0429	4.0429	4.0478	4.0526	4.0572	4.0617	4.0478	4.0572	4.0478
util living area	0.9813	0.9696	0.9359	0.8556	0.7192	0.5137	0.3786	0.4001	0.6498	0.8789	0.9631	0.9846 (86)
MIT	19.7385	19.9059	20.2321	20.5986	20.8519	20.9707	20.9933	20.9919	20.9256	20.6226	20.1419	19.7119 (87)
Th 2	19.9899	19.9945	19.9930	19.9960	19.9960	19.9974	19.9989	20.0002	20.0015	19.9974	20.0002	19.9974 (88)
util rest of house	0.9768	0.9625	0.9209	0.8231	0.6600	0.4312	0.2838	0.3006	0.5674	0.8429	0.9528	0.9809 (89)
MIT 2	18.8601	19.0278	19.3425	19.6857	19.9009	19.9845	19.9971	19.9981	19.9632	19.7171	19.2660	18.8401 (90)
Living area fraction									fLA = Living area / (4) =			0.2062 (91)
MIT	19.0412	19.2089	19.5259	19.8740	20.0970	20.1879	20.2026	20.2031	20.1617	19.9038	19.4466	19.0199 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0412	19.2089	19.5259	19.8740	20.0970	20.1879	20.2026	20.2031	20.1617	19.9038	19.4466	19.0199 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9713	0.9556	0.9126	0.8186	0.6664	0.4474	0.3034	0.3211	0.5814	0.8391	0.9457	0.9761	(94)
Useful gains	1019.7586	1132.3528	1232.7884	1238.2176	1042.9975	725.5270	468.1793	466.9353	777.3743	983.4470	991.8634	958.8684	(95)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000	(96)
Heat loss rate W	2167.5432	2120.9651	1913.2907	1579.3381	1156.5740	742.9501	470.8497	470.2074	826.3839	1292.5601	1749.6615	2130.9845	(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	853.9517	664.3475	506.2937	245.6067	84.5009	0.0000	0.0000	0.0000	0.0000	229.9801	545.6147	872.0544	(98)
Space heating												4002.3496	(98)
Space heating per m2												29.0742	(99)

(98) / (4) = 29.0742 (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 %)													90.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4407.8740 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	853.9517	664.3475	506.2937	245.6067	84.5009	0.0000	0.0000	0.0000	0.0000	229.9801	545.6147	872.0544	(98)
Space heating efficiency (main heating system 1)	90.8000	90.8000	90.8000	90.8000	90.8000	0.0000	0.0000	0.0000	0.0000	90.8000	90.8000	90.8000	(210)
Space heating fuel (main heating system)	940.4754	731.6602	557.5922	270.4920	93.0626	0.0000	0.0000	0.0000	0.0000	253.2821	600.8972	960.4123	(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	180.0914	141.1890	115.9126	62.2491	33.7688	6.6274	2.3462	31.9386	63.8767	116.9550	154.5773	180.4742	(64)
Efficiency of water heater (217)m	88.7356	88.7227	88.5953	88.4119	87.4640	80.1000	80.1000	80.1000	80.1000	86.8873	88.1990	88.1000	(216)
Fuel for water heating, kWh/month	202.9529	159.1352	130.8339	70.4080	38.6088	8.2739	2.9291	39.8734	79.7462	134.6054	175.2597	203.3128	(219)
Water heating fuel used												1245.9394	(219)
Annual totals kWh/year													
Space heating fuel - main system												4407.8740	(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)												487.0745	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.30 * 1156 * 1.00) =										-1202.4799		-1202.4799	(233)
Total delivered energy for all uses												5063.4080	(238)

10a. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4407.8740	10.2300	450.9255	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1245.9394	10.2300	127.4596	(247)
Pumps and fans for heating	75.0000	36.7200	27.5400	(249)
Pump for solar water heating	50.0000	36.7200	18.3600	(249)
Energy for lighting	487.0745	36.7200	178.8538	(250)
Additional standing charges			103.0000	(251)
Energy saving/generation technologies				
PV Unit	-1202.4799	36.7200	-441.5506	(252)
Total energy cost			464.5883	(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	4407.8740	0.2160	952.1008	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1245.9394	0.2160	269.1229	(264)
Space and water heating			1221.2237	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	487.0745	0.5190	252.7917	(268)

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 saving/generation technologies			
PV Unit	-1202.4799	0.5190	-624.0871 (269)
Total kg/year			914.8033 (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	4407.8740	1.2200	5377.6063 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1245.9394	1.2200	1520.0461 (264)
Space and water heating			6897.6524 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	487.0745	3.0700	1495.3189 (268)
Energy saving/generation technologies			
PV Unit	-1202.4799	3.0700	-3691.6133 (269)
Primary energy kWh/year			5085.1079 (272)
Primary energy kWh/m2/year			36.9396 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 45	Issued on Date	19/12/2023
Assessment Reference	As Built	Prop Type Ref	K
Project	19 Fieldfare Crescent, Botley, SOUTHAMPTON, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.80	TER	15.83
Environmental	90 B	% DER<TER	25.46		
CO ₂ Emissions (t/year)	1.19	DFEE	43.88	TFEE	54.73
General Requirements Compliance	Pass	% DFEE<TFEE	19.82		

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 (%)
Ext surface				0.0400	
Layer 1	Mineral wool batt				
	Main construction	350	0.0380	9.2105	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 2	Mineral wool batt				
	Main construction	100	0.0380	2.6316	87.50
	Main construction	100	0.1300	0.7692	12.50
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

Total resistance: Upper limit = 11.772 m² K/W Lower limit = 11.430 m² K/W Average = 11.601 m² K/W
Total correction = 0.0096 m² K/W U-value (unrounded) = 0.1 W/m² K

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 45	Issued on Date	19/12/2023
Assessment Reference	As Built	Prop Type Ref	K
Project	19 Fieldfare Crescent, Botley, SOUTHAMPTON, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.80	TER	15.83
Environmental	90 B	% DER<TER	25.46		
CO ₂ Emissions (t/year)	1.19	DFEE	43.88	TFEE	54.73
General Requirements Compliance	Pass	% DFEE<TFEE	19.82		

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 000003

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 0645 Plot 45	Issued on Date	19/12/2023
Assessment Reference	As Built	Prop Type Ref	K
Project	19 Fieldfare Crescent, Botley, SOUTHAMPTON, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.80	TER	15.83
Environmental	90 B	% DER<TER	25.46		
CO ₂ Emissions (t/year)	1.19	DFEE	43.88	TFEE	54.73
General Requirements Compliance	Pass	% DFEE<TFEE	19.82		

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

Building Elements

Floor 000004 - Floor - suspended beam-and-block floor

Floor Type: Suspended Floor

Area = 70.35 m², Perimeter = 35.55 m, Wall thickness = 300.00 mm, Soil: Clay

Depth of underfloor space below ground: 0.200 m Floor wind shielding: Average (suburban)

Floor height above ground: h = 0.000 m

U-value of walls above ground: U_w = 1.500 m

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

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				0.1700			
Layer 1	Extruded polystyrene						
	Main construction	100	0.0270	3.7037	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Extruded polystyrene						
	Main construction	200	0.0270	7.4074	91.67		
	Main construction	200	2.3000	0.0870	8.33		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Concrete, reinforced (1% steel)						
	Main construction	75	2.3000	0.0326	100.00	2000	1000
Layer 4	Screed						
	Main construction	75	1.1500	0.0652	100.00	1200	1000
Int surface				0.1700			

Total resistance:	Upper limit = 10.093 m ² K/W	Lower limit = 5.066 m ² K/W	Average = 7.579 m ² K/W
	Total correction = 0.0025 m ² K/W	U-value (unrounded) = 0.11 W/m ² K	

Unheated space: None

Total thickness: 450 mm

U-value: 0.11 W/m² K

Kappa: 140.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 45			Issued on Date	19/12/2023
Assessment Reference	As Built	Prop Type Ref	K		
Property	19 Fieldfare Crescent, Botley, SOUTHAMPTON, SO32 2TW				
SAP Rating	90 B	DER	11.80	TER	15.83
Environmental	90 B	% DER<TER	25.46		
CO ₂ Emissions (t/year)	1.19	DFEE	43.88	TFEE	54.73
General Requirements Compliance	Pass	% DFEE<TFEE	19.82		
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	North West
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	2019
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:	35.41 m	69.44 m ²	2.39 m
	1st Storey:	33.07 m	68.22 m ²	2.67 m

7.0 Living Area	28.39	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	181.72	kJ/m ² K

9.0 External Walls			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	172.93	143.66

9.2 Internal Walls			Kappa	Area
Description	Construction		(kJ/m ² K)	(m ²)
Ground Floor Block	Dense block, plasterboard on dabs		75.00	56.33
Ground Floor Stud	Plasterboard on timber frame		9.00	53.91
First Floor Stud	Plasterboard on timber frame		9.00	159.79

10.0 External Roofs			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Pitched Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	69.44	69.44

10.2 Internal Ceilings			Kappa	Area
Description	Construction		(kJ/m ² K)	(m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor		9.00	68.22

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.11	140.00	69.44

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	68.22

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	Half Glazed Door	Double Low-E Soft 0.1			0.63		0.70	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
North West Elevation	Half Glazed Door	[1] Brick and Block	North West							2.12	
North West Elevation	Window	[1] Brick and Block	North West	None	0.41	Yes				0.84	
North West Elevation	Window	[1] Brick and Block	North West	None	0.00					8.20	
East Elevation	Window	[1] Brick and Block	North East	None	0.00					0.66	
South Elevation	Window	[1] Brick and Block	South East	None	0.00					17.45	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.26	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	0.92	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.60	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.41	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	6.28	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	5.54	0.056	No	Birtley Supatherm
Independently assessed	E3 Sill	12.06	0.021	No	Knauf P5
Independently assessed	E4 Jamb	36.60	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	35.41	0.062	No	BE-E5-23902
Independently assessed	E6 Intermediate floor within a dwelling	33.07	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	36.21	0.060	No	
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	3.54	0.240	No	
Independently assessed	E12 Gable (insulation at ceiling level)	1.27	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	29.76	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	9.54	-0.091	No	Knauf P24

Y-value 0.024 W/m²K

18.0 Pressure Testing

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

19.0 Mechanical Ventilation

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	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	28	
Total number of L.E.L. fittings	28	
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

0 Main Heating 1	Database	
Description	System Boiler	
Percentage of Heat	100	%
Database Ref. No.	18913	
Fuel Type	Mains gas	
Main Heating	BGB	
SAP Code	102	
In Winter	90.8	
In Summer	80.1	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	

25.0 Main Heating 2

None

Community Heating	None
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SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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	200.00	L
Loss	1.94	kWh/day
Pipes insulation	Fully insulated primary pipework	

31.0 Thermal Store

None

32.0 Photovoltaic Unit

One Dwelling

PV Cells kWp

1.30

Orientation

South East

Elevation

30°

Overshading

None Or Little

Connected to Dwelling

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	£124	B 91	