



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 18 Fieldfare Crescent
BOTLEY, SO32 2TW

Contact: Tobias Whiting
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Report Issue Date: 08/03/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 44			Issued on Date	08/03/2024
Assessment Reference	As Built	Prop Type Ref	K		
Property	18 Fieldfare Crescent, BOTLEY, SO32 2TW				
SAP Rating	90 B	DER	11.84	TER	15.68
Environmental	90 B	% DER<TER	24.49		
CO ₂ Emissions (t/year)	1.19	DFEE	44.01	TFEE	54.16
General Requirements Compliance	Pass	% DFEE<TFEE	18.73		
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)	15.68	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.84	kgCO ₂ /m ²	Pass
	-3.84 (-24.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.16	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.01	kWh/m ² /yr	
	-10.2 (-18.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
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	4.97 (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 0.18

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

4.97 (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

Calculation Type: New Build (As Built)

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SAP Rating	90 B	DER	11.84
Environmental	90 B	TER	15.68
CO ₂ Emissions (t/year)	1.19	% DER<TER	24.49
General Requirements Compliance	Pass	DFEE	44.01
		TFEE	54.16
		% DFEE<TFEE	18.73
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	35.59	2.21	BE-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	33.02	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	36.16	2.17	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	0.240	3.14	0.75	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	2.48	0.11	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	29.74	1.16	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	11.68	-1.06	Knauf P24

Total: **7.41** W/mK:
Y-Value: **0.024** W/m²K:

FULL SAP CALCULATION PRINTOUT

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General Requirements Compliance	Pass	% DFEE<TFEE	18.73		
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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) 15.68 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.84 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.0 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: 4.97 (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 0.18
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	69.6400 (1b)	x 2.3900 (2b)	= 166.4396 (1b) - (3b)
First floor	67.9900 (1c)	x 2.6700 (2c)	= 181.5333 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.9729 (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) = 0.1437 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3922 (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) =	0.3334 (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	0.4250	0.4167	0.4084	0.3667	0.3584	0.3167	0.3167	0.3084	0.3334	0.3584	0.3750	0.3917 (22b)
Effective ac	0.5903	0.5868	0.5834	0.5672	0.5642	0.5501	0.5501	0.5475	0.5556	0.5642	0.5703	0.5767 (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			69.6400	0.1100	7.6604	140.0000	9749.6000 (28a)
Brick and Block	172.7500	29.2700	143.4800	0.2400	34.4352	42.2200	6057.7256 (29a)
Pitched Roof	69.6400		69.6400	0.1000	6.9640	9.0000	626.7600 (30)
Total net area of external elements Aum(A, m ²)			312.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4794		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.1800			9.0000	478.6200 (32c)
First Floor Stud			159.5000			9.0000	1435.5000 (32c)
Internal Floor 1			67.9900			18.0000	1223.8200 (32d)
Internal Ceiling 1			67.9900			18.0000	1223.8200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25020.5956 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7961 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4080 (36)
Total fabric heat loss (33) + (36) = 89.8874 (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	67.7879	67.3852	66.9904	65.1360	64.7891	63.1740	63.1740	62.8749	63.7961	64.7891	65.4909	66.2247 (38)
Heat transfer coeff	157.6753	157.2725	156.8777	155.0234	154.6764	153.0614	153.0614	152.7623	153.6835	154.6764	155.3783	156.1121 (39)
Average = Sum(39)m / 12 =												155.0217 (39)
HLP	1.1456	1.1427	1.1399	1.1264	1.1239	1.1121	1.1121	1.1099	1.1166	1.1239	1.1290	1.1343 (40)
HLP (average)												1.1264 (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												2.9124 (42)
Average daily hot water use (litres/day)												103.3703 (43)
Daily hot water use	113.7073	109.5725	105.4377	101.3029	97.1681	93.0332	93.0332	97.1681	101.3029	105.4377	109.5725	113.7073 (44)
Energy conte	168.6246	147.4802	152.1863	132.6797	127.3094	109.8583	101.7999	116.8168	118.2120	137.7647	150.3809	163.3040 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4169 (45)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.2937	22.1220	22.8280	19.9020	19.0964	16.4787	15.2700	17.5225	17.7318	20.6647	22.5571	24.4956 (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												
224.3626	197.8242	207.9243	186.6197	183.0474	163.7983	157.5379	172.5548	172.1520	193.5027	204.3209	219.0420 (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	224.3626	197.8242	207.9243	186.6197	183.0474	163.7983	157.5379	172.5548	172.1520	193.5027	204.3209	219.0420 (64)
Total per year (kWh/year) = Sum(64)m =												2282.6869 (64)
Heat gains from water heating, kWh/month												
100.6581	89.3124	95.1924	87.2680	86.9208	79.6799	78.4389	83.4320	82.4575	90.3972	93.1537	98.8890 (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	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.5764	24.4931	19.9191	15.0801	11.2725	9.5167	10.2832	13.3665	17.9404	22.7795	26.5870	28.3428	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.7009	309.8835	301.8635	284.7897	263.2373	242.9809	229.4485	226.2659	234.2859	251.3596	272.9121	293.1684	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	(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)	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	(71)
Water heating gains (Table 5)	135.2931	132.9053	127.9467	121.2056	116.8290	110.6665	105.4286	112.1398	114.5243	121.5016	129.3801	132.9153	(72)
Total internal gains	539.2569	536.9684	519.4158	490.7619	461.0253	432.8507	414.8467	421.4586	436.4371	465.3272	498.5658	524.1130	(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	768.9241	939.2866	1099.3952	1258.8478	1366.4934	1351.6300	1292.3836	1193.4661	1081.0812	917.9312	775.6774	719.3511 (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	44.0790	44.1919	44.3031	44.8330	44.9336	45.4077	45.4077	45.4966	45.2239	44.9336	44.7306	44.5204
alpha	3.9386	3.9461	3.9535	3.9889	3.9956	4.0272	4.0272	4.0331	4.0149	3.9956	3.9820	3.9680
util living area	0.9944	0.9873	0.9700	0.9224	0.8198	0.6567	0.5023	0.5581	0.7928	0.9514	0.9891	0.9957 (86)
MIT	19.3727	19.6015	19.9463	20.3748	20.7215	20.9193	20.9787	20.9678	20.8217	20.3564	19.7825	19.3353 (87)
Th 2	19.9637	19.9661	19.9684	19.9793	19.9814	19.9909	19.9909	19.9927	19.9873	19.9814	19.9773	19.9729 (88)
util rest of house	0.9930	0.9842	0.9623	0.9018	0.7732	0.5749	0.3954	0.4488	0.7238	0.9344	0.9858	0.9946 (89)
MIT 2	18.4778	18.7067	19.0484	19.4700	19.7850	19.9488	19.9840	19.9811	19.8801	19.4620	18.8965	18.4476 (90)
Living area fraction												
MIT	18.5974	18.8263	19.1684	19.5909	19.9101	20.0784	20.1169	20.1130	20.0059	19.5815	19.0149	18.5662 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5974	18.8263	19.1684	19.5909	19.9101	20.0784	20.1169	20.1130	20.0059	19.5815	19.0149	18.5662 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9904	0.9795	0.9546	0.8924	0.7695	0.5825	0.4093	0.4625	0.7253	0.9259	0.9816	0.9925 (94)
Useful gains	761.5621	920.0008	1049.4519	1123.4578	1051.5045	787.3467	528.9521	552.0283	784.0668	849.8774	761.3821	713.9691 (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	2254.3406	2190.2237	1987.3861	1657.3328	1269.9089	838.5364	538.2972	567.2023	907.6365	1389.2262	1851.3114	2242.7344 (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	1110.6272	853.5898	697.8230	384.3900	162.4929	0.0000	0.0000	0.0000	0.0000	401.2755	784.7491	1137.4014 (98)
Space heating												5532.3489 (98)
Space heating per m2										(98) / (4) =		40.1973 (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													6092.8953 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1110.6272	853.5898	697.8230	384.3900	162.4929	0.0000	0.0000	0.0000	0.0000	401.2755	784.7491	1137.4014	(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)	1223.1577	940.0769	768.5276	423.3370	178.9569	0.0000	0.0000	0.0000	0.0000	441.9334	864.2611	1252.6447	(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	224.3626	197.8242	207.9243	186.6197	183.0474	163.7983	157.5379	172.5548	172.1520	193.5027	204.3209	219.0420	(64)
Efficiency of water heater	88.8063	88.5738	88.0984	87.0017	84.7992	80.1000	80.1000	80.1000	80.1000	87.0182	88.3616	80.1000	(216)
Fuel for water heating, kWh/month	252.6428	223.3439	236.0137	214.5013	215.8597	204.4923	196.6765	215.4243	214.9214	222.3703	231.2327	246.4394	(219)
Water heating fuel used												2673.9182	(219)
Annual totals kWh/year													
Space heating fuel - main system												6092.8953	(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)												487.0077	(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												8258.4670	(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	6092.8953	0.2160	1316.0654 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2673.9182	0.2160	577.5663 (264)
Space and water heating			1893.6317 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	487.0077	0.5190	252.7570 (268)
Energy saving/generation technologies			
PV Unit	-1070.3542	0.5190	-555.5138 (269)
Total CO2, kg/year			1629.7999 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.8400 (273)

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

DER			11.8400 ZC1
Total Floor Area		TFA	137.6300
Assumed number of occupants		N	2.9124
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			13.2053 ZC2
CO2 emissions from cooking, equation (L16)			1.3725 ZC3
Total CO2 emissions			26.4178 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			26.4178 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	69.6400 (1b)	x 2.3900 (2b)	= 166.4396 (1b) - (3b)
First floor	67.9900 (1c)	x 2.6700 (2c)	= 181.5333 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.9729 (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) =	0.1150 (8)	
Pressure test													Yes	
Measured/design AP50													5.0000	
Infiltration rate													0.3650 (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	0.3878	0.3800	0.3412	0.3335	0.2947	0.2947	0.2869	0.3102	0.3335	0.3490	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			69.6400	0.1300	9.0532			(28a)				
Brick and Block	172.7500	29.2700	143.4800	0.1800	25.8264			(29a)				
Pitched Roof	69.6400		69.6400	0.1300	9.0532			(30)				
Total net area of external elements Aum(A, m2)			312.0300					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		82.4711			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								13.7753 (36)				
Total fabric heat loss						(33) + (36) =		96.2464 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 66.3972	Feb 66.0484	Mar 65.7066	Apr 64.1009	May 63.8004	Jun 62.4019	Jul 62.4019	Aug 62.1429	Sep 62.9406	Oct 63.8004	Nov 64.4082	Dec 65.0436 (38)
Heat transfer coeff	162.6436	162.2949	161.9530	160.3473	160.0469	158.6483	158.6483	158.3893	159.1870	160.0469	160.6546	161.2900 (39)
Average = Sum(39)m / 12 =												160.3458 (39)
HLP	Jan 1.1817	Feb 1.1792	Mar 1.1767	Apr 1.1651	May 1.1629	Jun 1.1527	Jul 1.1527	Aug 1.1508	Sep 1.1566	Oct 1.1629	Nov 1.1673	Dec 1.1719 (40)
HLP (average)												1.1651 (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												2.9124 (42)
Average daily hot water use (litres/day)												103.3703 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.7073	109.5725	105.4377	101.3029	97.1681	93.0332	93.0332	97.1681	101.3029	105.4377	109.5725	113.7073 (44)
Energy conte	168.6246	147.4802	152.1863	132.6797	127.3094	109.8583	101.7999	116.8168	118.2120	137.7647	150.3809	163.3040 (45)
Energy content (annual)											Total = Sum(45)m =	1626.4169 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.2937	22.1220	22.8280	19.9020	19.0964	16.4787	15.2700	17.5225	17.7318	20.6647	22.5571	24.4956 (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	219.5507	193.4779	203.1124	181.9630	178.2354	159.1416	152.7259	167.7429	167.4953	188.6908	199.6642	214.2300 (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	219.5507	193.4779	203.1124	181.9630	178.2354	159.1416	152.7259	167.7429	167.4953	188.6908	199.6642	214.2300 (64)
Heat gains from water heating, kWh/month	96.8086	85.8354	91.3428	83.5427	83.0712	75.9545	74.5893	79.5825	78.7321	86.5476	89.4283	95.0394 (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	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.5764	24.4931	19.9191	15.0801	11.2725	9.5167	10.2832	13.3665	17.9404	22.7795	26.5870	28.3428	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.7009	309.8835	301.8635	284.7897	263.2373	242.9809	229.4485	226.2659	234.2859	251.3596	272.9121	293.1684	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	(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)	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	(71)
Water heating gains (Table 5)	130.1190	127.7312	122.7726	116.0315	111.6549	105.4924	100.2545	106.9657	109.3502	116.3274	124.2060	127.7412	(72)
Total internal gains	534.0828	531.7943	514.2417	485.5878	455.8511	427.6766	409.6726	416.2845	431.2630	460.1531	493.3916	518.9389	(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	763.7500	934.1125	1094.2211	1253.6737	1361.3193	1346.4559	1287.2095	1188.2920	1075.9070	912.7571	770.5033	714.1770 (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	58.7643	58.8906	59.0149	59.6059	59.7178	60.2442	60.2442	60.3427	60.0403	59.7178	59.4918	59.2575
alpha	4.9176	4.9260	4.9343	4.9737	4.9812	5.0163	5.0163	5.0228	5.0027	4.9812	4.9661	4.9505
util living area	0.9986	0.9959	0.9875	0.9565	0.8677	0.6990	0.5305	0.5917	0.8419	0.9767	0.9967	0.9990 (86)
MIT	19.6747	19.8579	20.1391	20.4957	20.7908	20.9494	20.9896	20.9826	20.8687	20.4738	20.0033	19.6432 (87)
Th 2	19.9346	19.9367	19.9387	19.9481	19.9498	19.9580	19.9580	19.9595	19.9549	19.9498	19.9463	19.9425 (88)
util rest of house	0.9981	0.9945	0.9830	0.9400	0.8198	0.6066	0.4110	0.4685	0.7685	0.9649	0.9953	0.9987 (89)
MIT 2	18.1653	18.4341	18.8438	19.3570	19.7461	19.9248	19.9543	19.9525	19.8498	19.3359	18.6541	18.1249 (90)
Living area fraction	18.3670	18.6244	19.0169	19.5091	19.8857	20.0617	20.0926	20.0901	fLA = Living area / (4) =	19.9860	19.4880	18.8344
MIT	18.3670	18.6244	19.0169	19.5091	19.8857	20.0617	20.0926	20.0901	19.9860	19.4880	18.8344	18.3278 (91)
Temperature adjustment												0.0000
adjusted MIT	18.3670	18.6244	19.0169	19.5091	19.8857	20.0617	20.0926	20.0901	19.9860	19.4880	18.8344	18.3278 (92)
												0.0000
												18.3278 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9970	0.9919	0.9775	0.9313	0.8164	0.6165	0.4269	0.4847	0.7710	0.9577	0.9930	0.9978 (94)	
Ext temp.	761.4378	926.5660	1069.5557	1167.4955	1111.4380	830.0711	549.4661	575.9419	829.5385	874.1651	765.1214	712.6049 (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	2287.9019	2227.3954	2027.1450	1701.1458	1310.0952	866.4854	554.0959	584.4731	936.9683	1422.4921	1885.1837	2278.6699 (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	1135.6893	874.1574	712.4464	384.2282	147.8009	0.0000	0.0000	0.0000	0.0000	407.9554	806.4448	1165.1524 (98)	
Space heating per m2												5633.8748 (98)	
												(98) / (4) =	40.9349 (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													6025.5346 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1135.6893	874.1574	712.4464	384.2282	147.8009	0.0000	0.0000	0.0000	0.0000	407.9554	806.4448	1165.1524	(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)	1214.6409	934.9277	761.9748	410.9393	158.0759	0.0000	0.0000	0.0000	0.0000	436.3159	862.5078	1246.1523	(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	219.5507	193.4779	203.1124	181.9630	178.2354	159.1416	152.7259	167.7429	167.4953	188.6908	199.6642	214.2300	(64)
Efficiency of water heater (217)m	88.5760	88.3531	87.8857	86.7612	84.3193	79.8000	79.8000	79.8000	79.8000	86.8185	88.1543	79.8000	(216)
Fuel for water heating, kWh/month	247.8672	218.9826	231.1096	209.7285	211.3815	199.4256	191.3859	210.2042	209.8939	217.3394	226.4941	241.6478	(219)
Water heating fuel used												2615.4602	(219)
Annual totals kWh/year													
Space heating fuel - main system												6025.5346	(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)												487.0077	(232)
Total delivered energy for all uses												9203.0025	(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	6025.5346	0.2160	1301.5155	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2615.4602	0.2160	564.9394	(264)
Space and water heating			1866.4549	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	487.0077	0.5190	252.7570	(268)
Total CO2, kg/m2/year			2158.1369	(272)
Emissions per m2 for space and water heating			13.5614	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			1.8365	(272b)
Emissions per m2 for pumps and fans			0.2828	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.5614 * 1.00) + 1.8365 + 0.2828, rounded to 2 d.p.			15.6800	(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	69.6400 (1b)	x 2.3900 (2b)	= 166.4396 (1b) - (3b)
First floor	67.9900 (1c)	x 2.6700 (2c)	= 181.5333 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.9729 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1150 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3635 (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) =	0.3089 (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	0.3939	0.3862	0.3784	0.3398	0.3321	0.2935	0.2935	0.2858	0.3089	0.3321	0.3476	0.3630 (22b)
Effective ac	0.5776	0.5746	0.5716	0.5577	0.5551	0.5431	0.5431	0.5408	0.5477	0.5551	0.5604	0.5659 (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			69.6400	0.1100	7.6604	140.0000	9749.6000 (28a)
Brick and Block	172.7500	29.2700	143.4800	0.2400	34.4352	42.2200	6057.7256 (29a)
Pitched Roof	69.6400		69.6400	0.1000	6.9640	9.0000	626.7600 (30)
Total net area of external elements Aum(A, m ²)			312.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4794		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.1800			9.0000	478.6200 (32c)
First Floor Stud			159.5000			9.0000	1435.5000 (32c)
Internal Floor 1			67.9900			18.0000	1223.8200 (32d)
Internal Ceiling 1			67.9900			9.0000	611.9100 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24408.6856 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 177.3500 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4080 (36)
Total fabric heat loss (33) + (36) = 89.8874 (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	66.3235	65.9776	65.6386	64.0460	63.7481	62.3610	62.3610	62.1041	62.8953	63.7481	64.3508	64.9810 (38)
Heat transfer coeff	156.2109	155.8650	155.5259	153.9334	153.6354	152.2484	152.2484	151.9915	152.7826	153.6354	154.2382	154.8684 (39)
Average = Sum(39)m / 12 =												153.9320 (39)
HLP	1.1350	1.1325	1.1300	1.1185	1.1163	1.1062	1.1062	1.1043	1.1101	1.1163	1.1207	1.1253 (40)
HLP (average)												1.1184 (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												2.9124 (42)
Average daily hot water use (litres/day)												103.3703 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7073	109.5725	105.4377	101.3029	97.1681	93.0332	93.0332	97.1681	101.3029	105.4377	109.5725	113.7073 (44)
Energy conte	168.6246	147.4802	152.1863	132.6797	127.3094	109.8583	101.7999	116.8168	118.2120	137.7647	150.3809	163.3040 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4169 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	35.8327	31.3395	32.3396	28.1944	27.0532	23.3449	21.6325	24.8236	25.1201	29.2750	31.9559	34.7021 (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	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.5764	24.4931	19.9191	15.0801	11.2725	9.5167	10.2832	13.3665	17.9404	22.7795	26.5870	28.3428	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.7009	309.8835	301.8635	284.7897	263.2373	242.9809	229.4485	226.2659	234.2859	251.3596	272.9121	293.1684	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	(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)	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	(71)
Water heating gains (Table 5)	48.1623	46.6362	43.4672	39.1590	36.3619	32.4235	29.0759	33.3650	34.8890	39.3481	44.3833	46.6426	(72)
Total internal gains	449.1261	447.6993	431.9363	405.7153	377.5581	351.6076	335.4941	339.6839	353.8018	380.1737	410.5689	434.8404	(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	678.7933	850.0175	1011.9157	1173.8012	1283.0263	1270.3869	1213.0309	1111.6914	998.4458	832.7777	687.6806	630.0785 (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	43.4041	43.5004	43.5952	44.0463	44.1317	44.5337	44.5337	44.6090	44.3780	44.1317	43.9592	43.7803	
alpha	3.8936	3.9000	3.9063	3.9364	3.9421	3.9689	3.9689	3.9739	3.9585	3.9421	3.9306	3.9187	
util living area	0.9961	0.9903	0.9754	0.9331	0.8382	0.6818	0.5275	0.5879	0.8194	0.9618	0.9922	0.9971	(86)
MIT	19.2818	19.5164	19.8713	20.3151	20.6844	20.9032	20.9732	20.9591	20.7889	20.2884	19.6961	19.2413	(87)
Th 2	19.9723	19.9744	19.9764	19.9858	19.9875	19.9958	19.9958	19.9973	19.9926	19.9875	19.9840	19.9803	(88)
util rest of house	0.9951	0.9878	0.9690	0.9150	0.7946	0.6009	0.4178	0.4765	0.7551	0.9481	0.9899	0.9963	(89)
MIT 2	18.3963	18.6312	18.9836	19.4213	19.7609	19.9437	19.9866	19.9820	19.8617	19.4047	18.8185	18.3619	(90)
Living area fraction	18.5146	18.7495	19.1022	19.5408	19.8843	20.0719	20.1185	20.1126	19.9856	19.5227	18.9357	18.4794	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5146	18.7495	19.1022	19.5408	19.8843	20.0719	20.1185	20.1126	19.9856	19.5227	18.9357	18.4794	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9931	0.9838	0.9620	0.9054	0.7895	0.6076	0.4318	0.4901	0.7546	0.9399	0.9865	0.9948	(94)
Ext temp.	674.1102	836.2756	973.4138	1062.7641	1012.9914	771.8308	523.8054	544.8389	753.3778	782.6910	678.3687	626.7833	(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	2220.4796	2158.6499	1959.9739	1637.9689	1257.4016	833.0941	535.6783	564.2788	899.2125	1370.8482	1825.5243	2211.4313	(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	1150.4988	888.6355	734.0007	414.1475	181.8412	0.0000	0.0000	0.0000	0.0000	437.5890	825.9520	1178.9781	(98)
Space heating												5811.6428	(98)
Space heating per m2												42.2266	(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	1431.1346	1126.6379	1155.1354	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8421	0.9010	0.8722	0.0000	0.0000	0.0000	0.0000	(101)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1205.1168	1015.0495	1007.4623	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1606.4070	1536.5724	1420.4736	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	288.9289	388.0130	307.2804	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												984.2223 (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	72.2322	97.0033	76.8201	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												246.0556 (107)
Space cooling per m2												1.7878 (108)
Energy for space heating												42.2266 (99)
Energy for space cooling												1.7878 (108)
Total												44.0144 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.0 (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	69.6400 (1b)	x 2.3900 (2b)	= 166.4396 (1b) - (3b)
First floor	67.9900 (1c)	x 2.6700 (2c)	= 181.5333 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.9729 (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) =	0.1150 (8)	
Pressure test															Yes		
Measured/design AP50															5.0000		
Infiltration rate															0.3650 (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	0.3878	0.3800	0.3412	0.3335	0.2947	0.2947	0.2869	0.3102	0.3335	0.3490	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			69.6400	0.1300	9.0532			(28a)				
Brick and Block	172.7500	29.2700	143.4800	0.1800	25.8264			(29a)				
Pitched Roof	69.6400		69.6400	0.1300	9.0532			(30)				
Total net area of external elements Aum(A, m2)			312.0300					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		82.4711			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								13.7753 (36)				
Total fabric heat loss						(33) + (36) =		96.2464 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 66.3972	Feb 66.0484	Mar 65.7066	Apr 64.1009	May 63.8004	Jun 62.4019	Jul 62.4019	Aug 62.1429	Sep 62.9406	Oct 63.8004	Nov 64.4082	Dec 65.0436 (38)
Heat transfer coeff	162.6436	162.2949	161.9530	160.3473	160.0469	158.6483	158.6483	158.3893	159.1870	160.0469	160.6546	161.2900 (39)
Average = Sum(39)m / 12 =												160.3458 (39)
HLP	Jan 1.1817	Feb 1.1792	Mar 1.1767	Apr 1.1651	May 1.1629	Jun 1.1527	Jul 1.1527	Aug 1.1508	Sep 1.1566	Oct 1.1629	Nov 1.1673	Dec 1.1719 (40)
HLP (average)												1.1651 (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												2.9124 (42)
Average daily hot water use (litres/day)												103.3703 (43)
Daily hot water use	Jan 113.7073	Feb 109.5725	Mar 105.4377	Apr 101.3029	May 97.1681	Jun 93.0332	Jul 93.0332	Aug 97.1681	Sep 101.3029	Oct 105.4377	Nov 109.5725	Dec 113.7073 (44)
Energy conte	168.6246	147.4802	152.1863	132.6797	127.3094	109.8583	101.7999	116.8168	118.2120	137.7647	150.3809	163.3040 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4169 (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	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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	35.8327	31.3395	32.3396	28.1944	27.0532	23.3449	21.6325	24.8236	25.1201	29.2750	31.9559	34.7021 (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	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	145.6216	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.5764	24.4931	19.9191	15.0801	11.2725	9.5167	10.2832	13.3665	17.9404	22.7795	26.5870	28.3428	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.7009	309.8835	301.8635	284.7897	263.2373	242.9809	229.4485	226.2659	234.2859	251.3596	272.9121	293.1684	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	37.5622	(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)	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	(71)
Water heating gains (Table 5)	48.1623	46.6362	43.4672	39.1590	36.3619	32.4235	29.0759	33.3650	34.8890	39.3481	44.3833	46.6426	(72)
Total internal gains	449.1261	447.6993	431.9363	405.7153	377.5581	351.6076	335.4941	339.6839	353.8018	380.1737	410.5689	434.8404	(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	678.7933	850.0175	1011.9157	1173.8012	1283.0263	1270.3869	1213.0309	1111.6914	998.4458	832.7777	687.6806	630.0785 (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, (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.7643	58.8906	59.0149	59.6059	59.7178	60.2442	60.2442	60.3427	60.0403	59.7178	59.4918	59.2575	
alpha	4.9176	4.9260	4.9343	4.9737	4.9812	5.0163	5.0163	5.0228	5.0027	4.9812	4.9661	4.9505	
util living area	0.9992	0.9973	0.9910	0.9659	0.8881	0.7288	0.5596	0.6260	0.8705	0.9839	0.9980	0.9994	(86)
MIT	19.6174	19.8018	20.0863	20.4512	20.7624	20.9390	20.9869	20.9777	20.8438	20.4246	19.9478	19.5863	(87)
Th 2	19.9346	19.9367	19.9387	19.9481	19.9498	19.9580	19.9580	19.9595	19.9549	19.9498	19.9463	19.9425	(88)
util rest of house	0.9989	0.9964	0.9876	0.9524	0.8445	0.6367	0.4352	0.4988	0.8035	0.9753	0.9972	0.9992	(89)
MIT 2	18.6694	18.8551	19.1394	19.5032	19.7886	19.9299	19.9547	19.9532	19.8664	19.4840	19.0088	18.6447	(90)
Living area fraction									fLA = Living area / (4) =			0.1336	(91)
MIT	18.7961	18.9816	19.2659	19.6299	19.9187	20.0648	20.0926	20.0901	19.9970	19.6097	19.1343	18.7705	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7961	18.9816	19.2659	19.6299	19.9187	20.0648	20.0926	20.0901	19.9970	19.6097	19.1343	18.7705	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9952	0.9848	0.9472	0.8430	0.6470	0.4519	0.5157	0.8067	0.9715	0.9962	0.9989	(94)
Ext temp.	677.7332	845.9174	996.4849	1111.8005	1081.5977	821.9552	548.1354	573.2625	805.4385	809.0495	685.0626	629.3963	(95)
Ext loss	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	2357.6959	2285.3708	2067.4768	1720.5114	1315.3796	866.9772	554.0989	584.4673	938.7227	1441.9768	1933.3648	2350.0793	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1249.8923	967.3127	796.8179	438.2718	173.9337	0.0000	0.0000	0.0000	0.0000	470.8979	898.7776	1280.1881	(98)
Space heating												6276.0921	(98)
Space heating per m2										(98) / (4) =		45.6012	(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	1491.2942	1173.9976	1203.7589	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8632	0.9237	0.8947	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1287.2489	1084.4540	1077.0414	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1606.4070	1536.5724	1420.4736	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	229.7939	336.3761	255.5135	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												821.6835	(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	57.4485	84.0940	63.8784	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												205.4209 (107)
Space cooling per m2												1.4926 (108)
Energy for space heating												45.6012 (99)
Energy for space cooling												1.4926 (108)
Total												47.0938 (109)
Target Fabric Energy Efficiency (TFEE)												54.2 (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	69.6400 (1b)	x 2.3900 (2b)	= 166.4396 (1b) - (3b)
First floor	67.9900 (1c)	x 2.6700 (2c)	= 181.5333 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.9729 (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) = 0.1437 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3922 (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) =	0.3334 (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	0.3500	0.3250	0.3334	0.3167	0.3167	0.3084	0.3000	0.2917	0.2834	0.3084	0.2917	0.3084 (22b)
Effective ac	0.5613	0.5528	0.5556	0.5501	0.5501	0.5475	0.5450	0.5425	0.5401	0.5475	0.5425	0.5475 (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			69.6400	0.1100	7.6604	140.0000	9749.6000 (28a)
Brick and Block	172.7500	29.2700	143.4800	0.2400	34.4352	42.2200	6057.7256 (29a)
Pitched Roof	69.6400		69.6400	0.1000	6.9640	9.0000	626.7600 (30)
Total net area of external elements Aum(A, m ²)			312.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4794		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.1800			9.0000	478.6200 (32c)
First Floor Stud			159.5000			9.0000	1435.5000 (32c)
Internal Floor 1			67.9900			18.0000	1223.8200 (32d)
Internal Ceiling 1			67.9900			18.0000	1223.8200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25020.5956 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7961 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4080 (36)
Total fabric heat loss (33) + (36) = 89.8874 (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	64.4501	63.4810	63.7961	63.1740	63.1740	62.8749	62.5838	62.3006	62.0255	62.8749	62.3006	62.8749 (38)
Heat transfer coeff	154.3375	153.3684	153.6835	153.0614	153.0614	152.7623	152.4711	152.1880	151.9128	152.7623	152.1880	152.7623 (39)
Average = Sum(39)m / 12 =												152.8799 (39)
HLP	1.1214	1.1144	1.1166	1.1121	1.1121	1.1099	1.1078	1.1058	1.1038	1.1099	1.1058	1.1099 (40)
HLP (average)												1.1108 (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												2.9124 (42)
Average daily hot water use (litres/day)												103.3703 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7073	109.5725	105.4377	101.3029	97.1681	93.0332	93.0332	97.1681	101.3029	105.4377	109.5725	113.7073 (44)
Energy conte	168.6246	147.4802	152.1863	132.6797	127.3094	109.8583	101.7999	116.8168	118.2120	137.7647	150.3809	163.3040 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4169 (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	25.2937	22.1220	22.8280	19.9020	19.0964	16.4787	15.2700	17.5225	17.7318	20.6647	22.5571	24.4956 (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	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
224.3626 197.8242 207.9243 186.6197 183.0474 163.7983 157.5379 172.5548 172.1520 193.5027 204.3209 219.0420 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	224.3626	197.8242	207.9243	186.6197	183.0474	163.7983	157.5379	172.5548	172.1520	193.5027	204.3209	219.0420 (64)
RHI water heating demand												2282.6869 (64)
Heat gains from water heating, kWh/month	100.6581	89.3124	95.1924	87.2680	86.9208	79.6799	78.4389	83.4320	82.4575	90.3972	93.1537	98.8890 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	68.9410	61.2328	49.7978	37.7002	28.1813	23.7919	25.7079	33.4162	44.8511	56.9488	66.4676	70.8571 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	457.7625	462.5127	450.5425	425.0593	392.8914	362.6581	342.4604	337.7103	349.6805	375.1636	407.3315	437.5648 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870 (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)	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973 (71)
Water heating gains (Table 5)	135.2931	132.9053	127.9467	121.2056	116.8290	110.6665	105.4286	112.1398	114.5243	121.5016	129.3801	132.9153 (72)
Total internal gains	778.6323	773.2864	744.9227	700.6007	654.5374	613.7522	590.2326	599.9019	625.6916	670.2496	719.8149	757.9729 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	W/m2	Specific data	factor	W
					or Table 6b	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	1062.8965	1198.0290	1365.3304	1533.0809	1591.8747	1648.7654	1570.3155	1480.1608	1356.0198	1186.6260	1061.8633	995.4201 (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	45.0323	45.3168	45.2239	45.4077	45.4077	45.4966	45.5835	45.6683	45.7510	45.4966	45.6683	45.4966
alpha	4.0022	4.0211	4.0149	4.0272	4.0272	4.0331	4.0389	4.0446	4.0501	4.0331	4.0446	4.0331
util living area	0.9806	0.9687	0.9344	0.8523	0.7133	0.5083	0.3740	0.3950	0.6446	0.8761	0.9618	0.9840 (86)
MIT	19.7366	19.9057	20.2321	20.6018	20.8547	20.9714	20.9935	20.9922	20.9271	20.6251	20.1453	19.7137 (87)
Th 2	19.9834	19.9891	19.9873	19.9909	19.9909	19.9927	19.9944	19.9961	19.9977	19.9927	19.9961	19.9927 (88)
util rest of house	0.9759	0.9614	0.9192	0.8192	0.6537	0.4261	0.2798	0.2962	0.5621	0.8396	0.9512	0.9801 (89)
MIT 2	18.8530	19.0232	19.3376	19.6838	19.8980	19.9802	19.9928	19.9941	19.9603	19.7149	19.2658	18.8381 (90)
Living area fraction									fLA = Living area / (4) =			0.1336 (91)
MIT	18.9711	19.1411	19.4571	19.8065	20.0258	20.1126	20.1265	20.1274	20.0895	19.8365	19.3833	18.9551 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9711	19.1411	19.4571	19.8065	20.0258	20.1126	20.1265	20.1274	20.0895	19.8365	19.3833	18.9551 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1030.9078	1142.5831	1241.8728	1245.4143	1044.2036	719.2310	459.1324	457.9054	773.1265	988.4011	1001.4243	970.2801 (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	2171.6973	2122.7943	1914.4531	1577.5275	1151.9138	735.1838	461.4541	460.7415	818.7290	1288.7767	1747.6253	2131.8170 (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	848.7474	658.7019	500.3998	239.1215	80.1364	0.0000	0.0000	0.0000	0.0000	223.4794	537.2647	864.1835 (98)
Space heating												3952.0346 (98)
RHI space heating demand												3952 (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	69.6400 (1b)	x 2.3900 (2b)	= 166.4396 (1b) - (3b)
First floor	67.9900 (1c)	x 2.6700 (2c)	= 181.5333 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.9729 (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) = 0.1437 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3922 (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) =	0.3334 (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	0.4250	0.4167	0.4084	0.3667	0.3584	0.3167	0.3167	0.3084	0.3334	0.3584	0.3750	0.3917 (22b)
Effective ac	0.5903	0.5868	0.5834	0.5672	0.5642	0.5501	0.5501	0.5475	0.5556	0.5642	0.5703	0.5767 (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			69.6400	0.1100	7.6604	140.0000	9749.6000 (28a)
Brick and Block	172.7500	29.2700	143.4800	0.2400	34.4352	42.2200	6057.7256 (29a)
Pitched Roof	69.6400		69.6400	0.1000	6.9640	9.0000	626.7600 (30)
Total net area of external elements Aum(A, m ²)			312.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4794		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.1800			9.0000	478.6200 (32c)
First Floor Stud			159.5000			9.0000	1435.5000 (32c)
Internal Floor 1			67.9900			18.0000	1223.8200 (32d)
Internal Ceiling 1			67.9900			18.0000	1223.8200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25020.5956 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7961 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4080 (36)
Total fabric heat loss (33) + (36) = 89.8874 (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	67.7879	67.3852	66.9904	65.1360	64.7891	63.1740	63.1740	62.8749	63.7961	64.7891	65.4909	66.2247 (38)
Heat transfer coeff	157.6753	157.2725	156.8777	155.0234	154.6764	153.0614	153.0614	152.7623	153.6835	154.6764	155.3783	156.1121 (39)
Average = Sum(39)m / 12 =												155.0217 (39)
HLP	1.1456	1.1427	1.1399	1.1264	1.1239	1.1121	1.1121	1.1099	1.1166	1.1239	1.1290	1.1343 (40)
HLP (average)												1.1264 (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												2.9124 (42)
Average daily hot water use (litres/day)												103.3703 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7073	109.5725	105.4377	101.3029	97.1681	93.0332	93.0332	97.1681	101.3029	105.4377	109.5725	113.7073 (44)
Energy conte	168.6246	147.4802	152.1863	132.6797	127.3094	109.8583	101.7999	116.8168	118.2120	137.7647	150.3809	163.3040 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4169 (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	25.2937	22.1220	22.8280	19.9020	19.0964	16.4787	15.2700	17.5225	17.7318	20.6647	22.5571	24.4956 (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												
224.3626	197.8242	207.9243	186.6197	183.0474	163.7983	157.5379	172.5548	172.1520	193.5027	204.3209	219.0420 (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	224.3626	197.8242	207.9243	186.6197	183.0474	163.7983	157.5379	172.5548	172.1520	193.5027	204.3209	219.0420 (64)
								Total per year (kWh/year) =	Sum(64)m =			2282.6869 (64)
Heat gains from water heating, kWh/month												
100.6581	89.3124	95.1924	87.2680	86.9208	79.6799	78.4389	83.4320	82.4575	90.3972	93.1537	98.8890 (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	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	68.9410	61.2328	49.7978	37.7002	28.1813	23.7919	25.7079	33.4162	44.8511	56.9488	66.4676	70.8571 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	457.7625	462.5127	450.5425	425.0593	392.8914	362.6581	342.4604	337.7103	349.6805	375.1636	407.3315	437.5648 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870 (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)	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973 (71)
Water heating gains (Table 5)	135.2931	132.9053	127.9467	121.2056	116.8290	110.6665	105.4286	112.1398	114.5243	121.5016	129.3801	132.9153 (72)
Total internal gains	778.6323	773.2864	744.9227	700.6007	654.5374	613.7522	590.2326	599.9019	625.6916	670.2496	719.8149	757.9729 (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	1008.2996	1175.6046	1324.9021	1468.6867	1560.0055	1532.5315	1467.7695	1371.9094	1270.3356	1122.8536	996.9265	953.2110 (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	44.0790	44.1919	44.3031	44.8330	44.9336	45.4077	45.4077	45.4966	45.2239	44.9336	44.7306	44.5204	
alpha	3.9386	3.9461	3.9535	3.9889	3.9956	4.0272	4.0272	4.0331	4.0149	3.9956	3.9820	3.9680	
util living area	0.9858	0.9735	0.9471	0.8840	0.7662	0.5967	0.4478	0.4948	0.7226	0.9139	0.9747	0.9885 (86)	
MIT	19.5724	19.7906	20.1105	20.4948	20.7870	20.9428	20.9858	20.9790	20.8751	20.4902	19.9613	19.5326 (87)	
Th 2	19.9637	19.9661	19.9684	19.9793	19.9814	19.9909	19.9909	19.9927	19.9873	19.9814	19.9773	19.9729 (88)	
util rest of house	0.9824	0.9673	0.9346	0.8568	0.7144	0.5169	0.3501	0.3940	0.6481	0.8876	0.9677	0.9857 (89)	
MIT 2	18.6755	18.8921	19.2057	19.5777	19.8357	19.9620	19.9864	19.9855	19.9158	19.5836	19.0714	18.6432 (90)	
Living area fraction									fLA = Living area / (4) =				0.1336 (91)
MIT	18.7953	19.0122	19.3266	19.7002	19.9628	20.0931	20.1200	20.1182	20.0440	19.7047	19.1903	18.7621 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7953	19.0122	19.3266	19.7002	19.9628	20.0931	20.1200	20.1182	20.0440	19.7047	19.1903	18.7621 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9773	0.9600	0.9251	0.8483	0.7134	0.5254	0.3629	0.4070	0.6526	0.8790	0.9607	0.9813 (94)
Useful gains	985.4547	1128.5356	1225.6552	1245.8177	1112.8944	805.2159	532.7095	558.3912	829.0591	986.9530	957.7244	935.3809 (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	2285.5565	2219.4571	2012.2039	1674.2863	1278.0652	840.7789	538.7734	568.0032	913.4894	1408.2882	1878.5668	2273.3143 (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	967.2757	733.0992	585.1922	308.4974	122.8870	0.0000	0.0000	0.0000	0.0000	313.4733	663.0065	995.4224 (98)
Space heating												4688.8538 (98)
Space heating per m2										(98) / (4) =		34.0685 (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													5163.9359 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	967.2757	733.0992	585.1922	308.4974	122.8870	0.0000	0.0000	0.0000	0.0000	313.4733	663.0065	995.4224	(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)	1065.2816	807.3780	644.4848	339.7548	135.3381	0.0000	0.0000	0.0000	0.0000	345.2349	730.1834	1096.2802	(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	224.3626	197.8242	207.9243	186.6197	183.0474	163.7983	157.5379	172.5548	172.1520	193.5027	204.3209	219.0420	(64)
Efficiency of water heater (217)m	88.5723	88.2936	87.7277	86.4474	84.0799	80.1000	80.1000	80.1000	80.1000	86.3951	88.0298	80.1000	(216)
Fuel for water heating, kWh/month	253.3101	224.0526	237.0109	215.8767	217.7066	204.4923	196.6765	215.4243	214.9214	223.9743	232.1043	247.0478	(219)
Water heating fuel used												2682.5977	(219)
Annual totals kWh/year													
Space heating fuel - main system												5163.9359	(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)												487.0077	(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												7338.1871	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5163.9359	3.4800	179.7050 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2682.5977	3.4800	93.3544 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	487.0077	13.1900	64.2363 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1070.3542	13.1900	-141.1797 (252)
Total energy cost			326.0085 (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] =	0.7497 (257)
SAP value		89.5412
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	5163.9359	0.2160	1115.4102 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2682.5977	0.2160	579.4411 (264)
Space and water heating			1694.8513 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	487.0077	0.5190	252.7570 (268)
Energy saving/generation technologies			
PV Unit	-1070.3542	0.5190	-555.5138 (269)
Total kg/year			1431.0194 (272)
CO2 emissions per m2			10.4000 (273)
EI value			89.5003
EI rating			90 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9080 = 3.833$, 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	69.6400 (1b)	x 2.3900 (2b)	= 166.4396 (1b) - (3b)
First floor	67.9900 (1c)	x 2.6700 (2c)	= 181.5333 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6300		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 347.9729 (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) = 0.1437 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3922 (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) =	0.3334 (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	0.3500	0.3250	0.3334	0.3167	0.3167	0.3084	0.3000	0.2917	0.2834	0.3084	0.2917	0.3084 (22b)
Effective ac	0.5613	0.5528	0.5556	0.5501	0.5501	0.5475	0.5450	0.5425	0.5401	0.5475	0.5425	0.5475 (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			69.6400	0.1100	7.6604	140.0000	9749.6000 (28a)
Brick and Block	172.7500	29.2700	143.4800	0.2400	34.4352	42.2200	6057.7256 (29a)
Pitched Roof	69.6400		69.6400	0.1000	6.9640	9.0000	626.7600 (30)
Total net area of external elements Aum(A, m ²)			312.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4794		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.1800			9.0000	478.6200 (32c)
First Floor Stud			159.5000			9.0000	1435.5000 (32c)
Internal Floor 1			67.9900			18.0000	1223.8200 (32d)
Internal Ceiling 1			67.9900			18.0000	1223.8200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25020.5956 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7961 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4080 (36)
Total fabric heat loss (33) + (36) = 89.8874 (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	64.4501	63.4810	63.7961	63.1740	63.1740	62.8749	62.5838	62.3006	62.0255	62.8749	62.3006	62.8749 (38)
Heat transfer coeff	154.3375	153.3684	153.6835	153.0614	153.0614	152.7623	152.4711	152.1880	151.9128	152.7623	152.1880	152.7623 (39)
Average = Sum(39)m / 12 =												152.8799 (39)
HLP	1.1214	1.1144	1.1166	1.1121	1.1121	1.1099	1.1078	1.1058	1.1038	1.1099	1.1058	1.1099 (40)
HLP (average)												1.1108 (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												2.9124 (42)
Average daily hot water use (litres/day)												103.3703 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7073	109.5725	105.4377	101.3029	97.1681	93.0332	93.0332	97.1681	101.3029	105.4377	109.5725	113.7073 (44)
Energy conte	168.6246	147.4802	152.1863	132.6797	127.3094	109.8583	101.7999	116.8168	118.2120	137.7647	150.3809	163.3040 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4169 (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	25.2937	22.1220	22.8280	19.9020	19.0964	16.4787	15.2700	17.5225	17.7318	20.6647	22.5571	24.4956 (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	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	224.3626	197.8242	207.9243	186.6197	183.0474	163.7983	157.5379	172.5548	172.1520	193.5027	204.3209	219.0420 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) =	Sum(63)m =			0.0000 (63)
Output from w/h												
	224.3626	197.8242	207.9243	186.6197	183.0474	163.7983	157.5379	172.5548	172.1520	193.5027	204.3209	219.0420 (64)
								Total per year (kWh/year) =	Sum(64)m =			2282.6869 (64)
Heat gains from water heating, kWh/month												
	100.6581	89.3124	95.1924	87.2680	86.9208	79.6799	78.4389	83.4320	82.4575	90.3972	93.1537	98.8890 (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	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	68.9410	61.2328	49.7978	37.7002	28.1813	23.7919	25.7079	33.4162	44.8511	56.9488	66.4676	70.8571 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	457.7625	462.5127	450.5425	425.0593	392.8914	362.6581	342.4604	337.7103	349.6805	375.1636	407.3315	437.5648 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870 (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)	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973 (71)
Water heating gains (Table 5)	135.2931	132.9053	127.9467	121.2056	116.8290	110.6665	105.4286	112.1398	114.5243	121.5016	129.3801	132.9153 (72)
Total internal gains	778.6323	773.2864	744.9227	700.6007	654.5374	613.7522	590.2326	599.9019	625.6916	670.2496	719.8149	757.9729 (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	1062.8965	1198.0290	1365.3304	1533.0809	1591.8747	1648.7654	1570.3155	1480.1608	1356.0198	1186.6260	1061.8633	995.4201 (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	45.0323	45.3168	45.2239	45.4077	45.4077	45.4966	45.5835	45.6683	45.7510	45.4966	45.6683	45.4966
alpha	4.0022	4.0211	4.0149	4.0272	4.0272	4.0331	4.0389	4.0446	4.0501	4.0331	4.0446	4.0331
util living area	0.9806	0.9687	0.9344	0.8523	0.7133	0.5083	0.3740	0.3950	0.6446	0.8761	0.9618	0.9840 (86)
MIT	19.7366	19.9057	20.2321	20.6018	20.8547	20.9714	20.9935	20.9922	20.9271	20.6251	20.1453	19.7137 (87)
Th 2	19.9834	19.9891	19.9873	19.9909	19.9909	19.9927	19.9944	19.9961	19.9977	19.9927	19.9961	19.9927 (88)
util rest of house	0.9759	0.9614	0.9192	0.8192	0.6537	0.4261	0.2798	0.2962	0.5621	0.8396	0.9512	0.9801 (89)
MIT 2	18.8530	19.0232	19.3376	19.6838	19.8980	19.9802	19.9928	19.9941	19.9603	19.7149	19.2658	18.8381 (90)
Living area fraction									fLA = Living area / (4) =			0.1336 (91)
MIT	18.9711	19.1411	19.4571	19.8065	20.0258	20.1126	20.1265	20.1274	20.0895	19.8365	19.3833	18.9551 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9711	19.1411	19.4571	19.8065	20.0258	20.1126	20.1265	20.1274	20.0895	19.8365	19.3833	18.9551 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1030.9078	1142.5831	1241.8728	1245.4143	1044.2036	719.2310	459.1324	457.9054	773.1265	988.4011	1001.4243	970.2801 (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	2171.6973	2122.7943	1914.4531	1577.5275	1151.9138	735.1838	461.4541	460.7415	818.7290	1288.7767	1747.6253	2131.8170 (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	848.7474	658.7019	500.3998	239.1215	80.1364	0.0000	0.0000	0.0000	0.0000	223.4794	537.2647	864.1835 (98)
Space heating												3952.0346 (98)
Space heating per m2												(98) / (4) = 28.7149 (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													4352.4610 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	848.7474	658.7019	500.3998	239.1215	80.1364	0.0000	0.0000	0.0000	0.0000	223.4794	537.2647	864.1835	(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)	934.7438	725.4426	551.1011	263.3497	88.2559	0.0000	0.0000	0.0000	0.0000	246.1227	591.7012	951.7439	(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	224.3626	197.8242	207.9243	186.6197	183.0474	163.7983	157.5379	172.5548	172.1520	193.5027	204.3209	219.0420	(64)
Efficiency of water heater (217)m	88.3329	88.0824	87.3739	85.7773	83.0811	80.1000	80.1000	80.1000	80.1000	85.4999	87.5768	80.1000	(216)
Fuel for water heating, kWh/month	253.9966	224.5898	237.9709	217.5630	220.3238	204.4923	196.6765	215.4243	214.9214	226.3193	233.3050	247.7519	(219)
Water heating fuel used												2693.3347	(219)
Annual totals kWh/year													
Space heating fuel - main system												4352.4610	(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)												487.0077	(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												6405.3235	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4352.4610	7.6100	331.2223 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2693.3347	7.6100	204.9628 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	487.0077	31.0800	151.3620 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1202.4799	31.0800	-373.7308 (252)
Total energy cost			442.1263 (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	4352.4610	0.2160	940.1316 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2693.3347	0.2160	581.7603 (264)
Space and water heating			1521.8919 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	487.0077	0.5190	252.7570 (268)
Energy saving/generation technologies			
PV Unit	-1202.4799	0.5190	-624.0871 (269)
Total kg/year			1189.4868 (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	4352.4610	1.2200	5310.0024 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2693.3347	1.2200	3285.8684 (264)
Space and water heating			8595.8708 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	487.0077	3.0700	1495.1137 (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

6629.6212 (272)
48.1699 (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	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 91	-275 kg (23.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£91 2.00 kg/m ²	B 91	B 91
Total Savings	£91 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 538 TEST (29 Feb 2024)
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	£175	£190	-£16
Mains gas	£641	£535	£106
Space heating	£460	£464	-£4
Water heating	£205	£110	£95
Lighting	£151	£151	£0
Generated (PV)	-£374	-£374	£0
Total cost of fuels	£442	£351	£90
Total cost of uses	£442	£351	£91
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	69.6400 (1b)	x 2.3900 (2b)	= 166.4396 (1b) - (3b)
First floor	67.9900 (1c)	x 2.6700 (2c)	= 181.5333 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.9729 (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) = 0.1437 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3922 (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) =	0.3334 (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	0.4250	0.4167	0.4084	0.3667	0.3584	0.3167	0.3167	0.3084	0.3334	0.3584	0.3750	0.3917 (22b)
Effective ac	0.5903	0.5868	0.5834	0.5672	0.5642	0.5501	0.5501	0.5475	0.5556	0.5642	0.5703	0.5767 (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			69.6400	0.1100	7.6604	140.0000	9749.6000 (28a)
Brick and Block	172.7500	29.2700	143.4800	0.2400	34.4352	42.2200	6057.7256 (29a)
Pitched Roof	69.6400		69.6400	0.1000	6.9640	9.0000	626.7600 (30)
Total net area of external elements Aum(A, m ²)			312.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4794		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.1800			9.0000	478.6200 (32c)
First Floor Stud			159.5000			9.0000	1435.5000 (32c)
Internal Floor 1			67.9900			18.0000	1223.8200 (32d)
Internal Ceiling 1			67.9900			18.0000	1223.8200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25020.5956 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7961 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4080 (36)
Total fabric heat loss (33) + (36) = 89.8874 (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	67.7879	67.3852	66.9904	65.1360	64.7891	63.1740	63.1740	62.8749	63.7961	64.7891	65.4909	66.2247 (38)
Heat transfer coeff	157.6753	157.2725	156.8777	155.0234	154.6764	153.0614	153.0614	152.7623	153.6835	154.6764	155.3783	156.1121 (39)
Average = Sum(39)m / 12 =												155.0217 (39)
HLP	1.1456	1.1427	1.1399	1.1264	1.1239	1.1121	1.1121	1.1099	1.1166	1.1239	1.1290	1.1343 (40)
HLP (average)												1.1264 (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												2.9124 (42)
Average daily hot water use (litres/day)												103.3703 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	113.7073	109.5725	105.4377	101.3029	97.1681	93.0332	93.0332	97.1681	101.3029	105.4377	109.5725	113.7073 (44)
Energy content (annual)	168.6246	147.4802	152.1863	132.6797	127.3094	109.8583	101.7999	116.8168	118.2120	137.7647	150.3809	163.3040 (45)
										Total = Sum(45)m =		1626.4169 (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	25.2937	22.1220	22.8280	19.9020	19.0964	16.4787	15.2700	17.5225	17.7318	20.6647	22.5571	24.4956 (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												
212.1843 186.8244 194.3502 168.0806 158.0747 139.4061 132.3326 148.2800 154.9636 179.9286 192.5354 206.8636 (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												103.3703 (H14)
Volume ratio Veff/V												1.0883 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-944.2506 (H17)
Solar input	-27.3814	-45.6917	-77.8181	-104.2916	-128.8435	-126.6737	-124.9997	-109.2128	-85.5355	-58.4107	-32.4783	-22.9135 (63)
Solar input (sum of months) = Sum (63)m =												-944.2506 (63)
Output from w/h												
184.8029 141.1327 116.5321 63.7890 29.2312 12.7324 7.3329 39.0672 69.4281 121.5179 160.0572 183.9501 (64)												
Total per year (kWh/year) = Sum (64)m =												1129.5737 (64)
Heat gains from water heating, kWh/month												
90.9154 80.5125 84.3331 72.4367 66.9426 60.1661 58.2746 64.0122 68.7068 79.5379 83.7253 89.1463 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
68.9410 61.2328 49.7978 37.7002 28.1813 23.7919 25.7079 33.4162 44.8511 56.9488 66.4676 70.8571 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
457.7625 462.5127 450.5425 425.0593 392.8914 362.6581 342.4604 337.7103 349.6805 375.1636 407.3315 437.5648 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.3870 55.3870 55.3870 55.3870 55.3870 55.3870 55.3870 55.3870 55.3870 55.3870 55.3870 55.3870 (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)												
-116.4973 -116.4973 -116.4973 -116.4973 -116.4973 -116.4973 -116.4973 -116.4973 -116.4973 -116.4973 -116.4973 -116.4973 (71)												
Water heating gains (Table 5)												
122.1981 119.8103 113.3509 100.6066 89.9767 83.5640 78.3261 86.0379 95.4261 106.9058 116.2851 119.8203 (72)												
Total internal gains												
765.5373 760.1914 730.3269 680.0017 627.6851 586.6497 563.1302 573.8000 606.5934 655.6538 706.7199 744.8779 (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	995.2046	1162.5096	1310.3063	1448.0877	1533.1532	1505.4290	1440.6670	1345.8075	1251.2374	1108.2578	983.8315	940.1160 (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	44.0790	44.1919	44.3031	44.8330	44.9336	45.4077	45.4077	45.4966	45.2239	44.9336	44.7306	44.5204
alpha	3.9386	3.9461	3.9535	3.9889	3.9956	4.0272	4.0272	4.0331	4.0149	3.9956	3.9820	3.9680
util living area												
0.9864 0.9744 0.9488 0.8880 0.7736 0.6052 0.4556 0.5033 0.7295 0.9169 0.9757 0.9890 (86)												
MIT	19.5617	19.7805	20.1004	20.4839	20.7790	20.9398	20.9849	20.9777	20.8706	20.4814	19.9510	19.5217 (87)
Th 2	19.9637	19.9661	19.9684	19.9793	19.9814	19.9909	19.9909	19.9927	19.9873	19.9814	19.9773	19.9729 (88)
util rest of house												
0.9832 0.9684 0.9366 0.8614 0.7224 0.5250 0.3565 0.4013 0.6553 0.8912 0.9690 0.9863 (89)												
MIT 2	18.6649	18.8822	19.1961	19.5681	19.8296	19.9604	19.9861	19.9850	19.9129	19.5758	19.0614	18.6325 (90)
Living area fraction												
MIT	18.7848	19.0022	19.3169	19.6904	19.9565	20.0913	20.1196	20.1176	20.0408	19.6968	19.1803	18.7513 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7848	19.0022	19.3169	19.6904	19.9565	20.0913	20.1196	20.1176	20.0408	19.6968	19.1803	18.7513 (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	0.9782	0.9612	0.9272	0.8527	0.7210	0.5334	0.3694	0.4144	0.6596	0.8825	0.9622	0.9821	(94)
Useful gains	973.5412	1117.4313	1214.8996	1234.8301	1105.4075	802.9940	532.2487	557.6623	825.3153	978.0797	946.5939	923.2788	(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	2283.8885	2217.8949	2010.6878	1672.7716	1277.0789	840.5014	538.7150	567.9115	913.0073	1407.0586	1877.0156	2271.6360	(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	974.8984	739.5116	592.0664	315.3179	127.7235	0.0000	0.0000	0.0000	0.0000	319.1603	669.9037	1003.1778	(98)
Space heating												4741.7596	(98)
Space heating per m2												34.4530	(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													5222.2022 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	974.8984	739.5116	592.0664	315.3179	127.7235	0.0000	0.0000	0.0000	0.0000	319.1603	669.9037	1003.1778	(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)	1073.6766	814.4401	652.0555	347.2664	140.6647	0.0000	0.0000	0.0000	0.0000	351.4981	737.7794	1104.8214	(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	184.8029	141.1327	116.5321	63.7890	29.2312	12.7324	7.3329	39.0672	69.4281	121.5179	160.0572	183.9501	(64)
Efficiency of water heater (217)m	88.9074	88.8969	88.8482	88.8040	88.5959	80.1000	80.1000	80.1000	80.1000	87.5741	88.5196	88.9586	(216)
Fuel for water heating, kWh/month	207.8599	158.7600	131.1587	71.8313	32.9938	15.8956	9.1547	48.7730	86.6767	138.7600	180.8155	206.7816	(219)
Water heating fuel used												1289.4610	(219)
Annual totals kWh/year													
Space heating fuel - main system												5222.2022	(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)												487.0077	(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												6053.3168	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5222.2022	3.4800	181.7326	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1289.4610	3.4800	44.8732	(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	487.0077	13.1900	64.2363	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1070.3542	13.1900	-141.1797	(252)
Total energy cost			286.1500	(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] =	0.6581 (257)
SAP value			90.8199
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	5222.2022	0.2160	1127.9957 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1289.4610	0.2160	278.5236 (264)
Space and water heating			1406.5193 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	487.0077	0.5190	252.7570 (268)
Energy saving/generation technologies			
PV Unit	-1070.3542	0.5190	-555.5138 (269)
Total kg/year			1168.6374 (272)
CO2 emissions per m2			8.4900 (273)
EI value			91.4254
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	69.6400 (1b)	x 2.3900 (2b)	= 166.4396 (1b) - (3b)
First floor	67.9900 (1c)	x 2.6700 (2c)	= 181.5333 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 347.9729 (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) = 0.1437 (8)
Pressure test					Yes
Measured/design AP50					4.9700
Infiltration rate					0.3922 (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) =		0.3334 (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	0.3500	0.3250	0.3334	0.3167	0.3167	0.3084	0.3000	0.2917	0.2834	0.3084	0.2917	0.3084 (22b)
Effective ac	0.5613	0.5528	0.5556	0.5501	0.5501	0.5475	0.5450	0.5425	0.5401	0.5475	0.5425	0.5475 (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			69.6400	0.1100	7.6604	140.0000	9749.6000 (28a)
Brick and Block	172.7500	29.2700	143.4800	0.2400	34.4352	42.2200	6057.7256 (29a)
Pitched Roof	69.6400		69.6400	0.1000	6.9640	9.0000	626.7600 (30)
Total net area of external elements Aum(A, m ²)			312.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.4794		(33)
Ground Floor Block			56.3300			75.0000	4224.7500 (32c)
Ground Floor Stud			53.1800			9.0000	478.6200 (32c)
First Floor Stud			159.5000			9.0000	1435.5000 (32c)
Internal Floor 1			67.9900			18.0000	1223.8200 (32d)
Internal Ceiling 1			67.9900			18.0000	1223.8200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 25020.5956 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 181.7961 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4080 (36)
Total fabric heat loss (33) + (36) = 89.8874 (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	64.4501	63.4810	63.7961	63.1740	63.1740	62.8749	62.5838	62.3006	62.0255	62.8749	62.3006	62.8749 (38)
Heat transfer coeff	154.3375	153.3684	153.6835	153.0614	153.0614	152.7623	152.4711	152.1880	151.9128	152.7623	152.1880	152.7623 (39)
Average = Sum(39)m / 12 =												152.8799 (39)
HLP	1.1214	1.1144	1.1166	1.1121	1.1121	1.1099	1.1078	1.1058	1.1038	1.1099	1.1058	1.1099 (40)
HLP (average)												1.1108 (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												2.9124 (42)
Average daily hot water use (litres/day)												103.3703 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7073	109.5725	105.4377	101.3029	97.1681	93.0332	93.0332	97.1681	101.3029	105.4377	109.5725	113.7073 (44)
Energy conte	168.6246	147.4802	152.1863	132.6797	127.3094	109.8583	101.7999	116.8168	118.2120	137.7647	150.3809	163.3040 (45)
Energy content (annual)										Total = Sum(45)m =		1626.4169 (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	25.2937	22.1220	22.8280	19.9020	19.0964	16.4787	15.2700	17.5225	17.7318	20.6647	22.5571	24.4956 (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												
212.1843	186.8244	194.3502	168.0806	158.0747	139.4061	132.3326	148.2800	154.9636	179.9286	192.5354	206.8636 (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												1.2480 (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												103.3703 (H14)
Volume ratio Veff/V												1.0883 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-983.8316 (H17)
Solar input	-32.0950	-45.6370	-78.4390	-105.8324	-124.3065	-132.7790	-129.9866	-116.3420	-91.0877	-62.9749	-37.9599	-26.3914 (63)
Solar input (sum of months) = Sum(63)m =												-983.8316 (63)
Output from w/h												
180.0893	141.1874	115.9112	62.2482	33.7682	6.6271	2.3459		31.9380	63.8759	116.9537	154.5755	180.4722 (64)
Total per year (kWh/year) = Sum(64)m =												1089.9926 (64)
Heat gains from water heating, kWh/month												
90.9154	80.5125	84.3331	72.4367	66.9426	60.1661	58.2746	64.0122	68.7068	79.5379	83.7253	89.1463 (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	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460	174.7460 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	68.9410	61.2328	49.7978	37.7002	28.1813	23.7919	25.7079	33.4162	44.8511	56.9488	66.4676	70.8571 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	457.7625	462.5127	450.5425	425.0593	392.8914	362.6581	342.4604	337.7103	349.6805	375.1636	407.3315	437.5648 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870	55.3870 (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)												
	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973	-116.4973 (71)
Water heating gains (Table 5)												
	122.1981	119.8103	113.3509	100.6066	89.9767	83.5640	78.3261	86.0379	95.4261	106.9058	116.2851	119.8203 (72)
Total internal gains												
	765.5373	760.1914	730.3269	680.0017	627.6851	586.6497	563.1302	573.8000	606.5934	655.6538	706.7199	744.8779 (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					1049.8015	1184.9340	1350.7346	1512.4819	1565.0223	1621.6629	1543.2130	1454.0588	1336.9216	1172.0302	1048.7683	982.3251 (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	45.0323	45.3168	45.2239	45.4077	45.4077	45.4966	45.5835	45.6683	45.7510	45.4966	45.6683	45.4966
alpha	4.0022	4.0211	4.0149	4.0272	4.0272	4.0331	4.0389	4.0446	4.0501	4.0331	4.0446	4.0331
util living area												
	0.9814	0.9698	0.9364	0.8568	0.7212	0.5158	0.3803	0.4017	0.6514	0.8798	0.9633	0.9847 (86)
MIT	19.7260	19.8957	20.2225	20.5924	20.8487	20.9698	20.9931	20.9917	20.9242	20.6176	20.1356	19.7030 (87)
Th 2	19.9834	19.9891	19.9873	19.9909	19.9909	19.9927	19.9944	19.9961	19.9977	19.9927	19.9961	19.9927 (88)
util rest of house												
	0.9769	0.9627	0.9215	0.8243	0.6619	0.4327	0.2847	0.3014	0.5687	0.8439	0.9530	0.9809 (89)
MIT 2	18.8427	19.0135	19.3286	19.6758	19.8937	19.9794	19.9927	19.9940	19.9587	19.7086	19.2565	18.8276 (90)
Living area fraction									fLA = Living area / (4) =			0.1336 (91)
MIT	18.9608	19.1314	19.4480	19.7983	20.0213	20.1118	20.1264	20.1273	20.0877	19.8301	19.3740	18.9446 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9608	19.1314	19.4480	19.7983	20.0213	20.1118	20.1264	20.1273	20.0877	19.8301	19.3740	18.9446 (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	0.9710	0.9551	0.9120	0.8173	0.6638	0.4429	0.2974	0.3148	0.5767	0.8372	0.9450	0.9758	(94)
Useful gains	1019.3622	1131.7791	1231.8146	1236.1119	1038.8398	718.2189	458.9590	457.6908	770.9736	981.1727	991.0814	958.5099	(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	2170.1010	2121.3007	1913.0589	1576.2715	1151.2254	735.0584	461.4315	460.7137	818.4593	1287.7966	1746.2020	2130.2055	(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	856.1497	664.9585	506.8458	244.9149	83.6149	0.0000	0.0000	0.0000	0.0000	228.1282	543.6868	871.7415	(98)
Space heating												4000.0403	(98)
Space heating per m2												29.0637	(99)

(98) / (4) = 29.0637 (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													4405.3308 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	856.1497	664.9585	506.8458	244.9149	83.6149	0.0000	0.0000	0.0000	0.0000	228.1282	543.6868	871.7415	(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)	942.8961	732.3332	558.2002	269.7301	92.0869	0.0000	0.0000	0.0000	0.0000	251.2425	598.7740	960.0677	(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	180.0893	141.1874	115.9112	62.2482	33.7682	6.6271	2.3459	31.9380	63.8759	116.9537	154.5755	180.4722	(64)
Efficiency of water heater (217)m	88.7399	88.7242	88.5972	88.4067	87.4398	80.1000	80.1000	80.1000	80.1000	86.8672	88.1920	88.7662	(216)
Fuel for water heating, kWh/month	202.9407	159.1306	130.8295	70.4112	38.6187	8.2735	2.9288	39.8727	79.7452	134.6350	175.2716	203.3118	(219)
Water heating fuel used												1245.9692	(219)
Annual totals kWh/year													
Space heating fuel - main system												4405.3308	(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)												487.0077	(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												5060.8277	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4405.3308	7.6100	335.2457	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1245.9692	7.6100	94.8183	(247)
Pumps and fans for heating	75.0000	31.0800	23.3100	(249)
Pump for solar water heating	50.0000	31.0800	15.5400	(249)
Energy for lighting	487.0077	31.0800	151.3620	(250)
Additional standing charges			105.0000	(251)
Energy saving/generation technologies				
PV Unit	-1202.4799	31.0800	-373.7308	(252)
Total energy cost			351.5452	(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	4405.3308	0.2160	951.5514	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1245.9692	0.2160	269.1293	(264)
Space and water heating			1220.6808	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	487.0077	0.5190	252.7570	(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			914.2257 (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	4405.3308	1.2200	5374.5035 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1245.9692	1.2200	1520.0824 (264)
Space and water heating			6894.5859 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	487.0077	3.0700	1495.1137 (268)
Energy saving/generation technologies			
PV Unit	-1202.4799	3.0700	-3691.6133 (269)
Primary energy kWh/year			5081.8363 (272)
Primary energy kWh/m2/year			36.9239 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 44	Issued on Date	08/03/2024
Assessment Reference	As Built	Prop Type Ref	K
Project	18 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.84	TER	15.68
Environmental	90 B	% DER<TER	24.49		
CO ₂ Emissions (t/year)	1.19	DFEE	44.01	TFEE	54.16
General Requirements Compliance	Pass	% DFEE<TFEE	18.73		

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 44	Issued on Date	08/03/2024
Assessment Reference	As Built	Prop Type Ref	K
Project	18 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.84	TER	15.68
Environmental	90 B	% DER<TER	24.49		
CO ₂ Emissions (t/year)	1.19	DFEE	44.01	TFEE	54.16
General Requirements Compliance	Pass	% DFEE<TFEE	18.73		

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 44	Issued on Date	08/03/2024
Assessment Reference	As Built	Prop Type Ref	K
Project	18 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	90 B	DER	11.84	TER	15.68
Environmental	90 B	% DER<TER	24.49		
CO ₂ Emissions (t/year)	1.19	DFEE	44.01	TFEE	54.16
General Requirements Compliance	Pass	% DFEE<TFEE	18.73		

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

Floor 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 44			Issued on Date	08/03/2024
Assessment Reference	As Built	Prop Type Ref	K		
Property	18 Fieldfare Crescent, BOTLEY, SO32 2TW				
SAP Rating	90 B	DER	11.84	TER	15.68
Environmental	90 B	% DER<TER	24.49		
CO ₂ Emissions (t/year)	1.19	DFEE	44.01	TFEE	54.16
General Requirements Compliance	Pass	% DFEE<TFEE	18.73		
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:	35.39 m	69.64 m ²	2.39 m
	1st Storey:	33.02 m	67.99 m ²	2.67 m

7.0 Living Area	18.39	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	181.8	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	172.75	143.48

9.2 Internal Walls		Construction	Kappa	Area
Description			(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	53.18
First Floor Stud		Plasterboard on timber frame	9.00	159.50

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	69.64	69.64

10.2 Internal Ceilings		Construction	Kappa	Area
Description			(kJ/m ² K)	(m ²)
Internal Ceiling 1		Plasterboard ceiling, carpeted chipboard floor	9.00	67.99

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	69.64

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	67.99

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Elevation	Half Glazed Door	[1] Brick and Block	North West							2.12	
Front Elevation	Window	[1] Brick and Block	North West	None	0.18	Yes				0.84	
Front Elevation	Window	[1] Brick and Block	North West	None	0.00					8.20	
Side 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)	35.59	0.062	No	BE-E5-23902
Independently assessed	E6 Intermediate floor within a dwelling	33.02	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	36.16	0.060	No	
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	3.14	0.240	No	
Independently assessed	E12 Gable (insulation at ceiling level)	2.48	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	29.74	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	11.68	-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	
	4.97	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather Windows half open

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Cross ventilation possible

Night Ventilation

Air change rate

Mechanical Ventilation

Mechanical Ventilation System Present

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

22.0 Lighting

Internal

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

External

External lights fitted

Light and motion sensor

23.0 Electricity Tariff

24.0 Main Heating 1

Description

Percentage of Heat %

Database Ref. No.

Fuel Type

Main Heating

SAP Code

In Winter

In Summer

Controls

PCDF Controls

Delayed Start Stat

Sap Code

Flue Type

Fan Assisted Flue

Is MHS Pumped

Heat Emitter

Flow Temperature

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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			
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32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.30	South East	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£91	B 91	