



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 5, Nuthatch Way
Botley, SO32 2UH

Contact: Tobias Whiting
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Report Issue Date: 03/01/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 48	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Property	5, Nuthatch Way, Botley, SO32 2UH		
SAP Rating	87 B	DER	14.01
Environmental	89 B	TER	18.09
CO ₂ Emissions (t/year)	0.88	% DER<TER	22.54
General Requirements Compliance	Pass	DfEE	41.56
		TfEE	51.38
		% DfEE<TfEE	19.11
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)	18.09	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.01	kgCO ₂ /m ²	Pass
	-4.08 (-22.6%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	51.38	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	41.56	kWh/m ² /yr	
	-9.8 (-19.1%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (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	4.64 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

This report has been produced by an accredited Elmhurst member whose work is subject to quality assurance audits. The data used to produce the report has been verified by the Elmhurst members' portal.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 36CDi Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

3.67 m², No overhang

Windows facing South West

8.00 m², No overhang

Windows facing North West

1.32 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.11	W/m ² K
Door U-value	1.10	W/m ² K
Thermal bridging ψ -value	0.035	W/m ² K
Photovoltaic array	0.65	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 48	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Property	5, Nuthatch Way, Botley, SO32 2UH		
SAP Rating	87 B	DER	14.01
Environmental	89 B	TER	18.09
CO ₂ Emissions (t/year)	0.88	% DER<TER	22.54
General Requirements Compliance	Pass	DFEE	41.56
		TFEE	51.38
		% DFEE<TFEE	19.11
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	0.093	0.49	0.05	Birtley Supatherm
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	3.76	0.27	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	3.91	0.26	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	1.77	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	8.66	0.18	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	28.50	0.46	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.062	18.69	1.16	BE-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.69	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	13.85	0.83	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	4.84	0.21	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	15.15	0.59	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.036	5.05	0.18	Knauf P25 Halved
External wall	E25 Staggered party wall between dwellings	Independently assessed	0.055	5.05	0.28	Knauf P27 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.47	1.36	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.47	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.47	0.30	Knauf P29 Halved

Total: **6.33** W/mK:
Y-Value: **0.035** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 48			Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L		
Property	5, Nuthatch Way, Botley, SO32 2UH				
SAP Rating	87 B	DER	14.01	TER	18.09
Environmental	89 B	% DER<TER	22.54		
CO ₂ Emissions (t/year)	0.88	DFEE	41.56	TFEE	51.38
General Requirements Compliance	Pass	% DFEE<TFEE	19.11		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

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

DWELLING AS BUILT

End-Terrace House, total floor area 84 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.09 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.01 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)41.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (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: 4.64 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 36CDi Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading:
Average
Windows facing North East: 3.67 m², No overhang
Windows facing South West: 8.00 m², No overhang
Windows facing North West: 1.32 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.11 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.035 W/m²K
Photovoltaic array 0.65 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1700 (1b)	x 2.3900 (2b)	= 100.7863 (1b) - (3b)
First floor	42.1700 (1c)	x 2.6700 (2c)	= 112.5939 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.3802 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1875 (8)
Pressure test					Yes
Measured/design AP50					4.6400
Infiltration rate					0.4195 (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) =	0.3565 (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	0.4546	0.4457	0.4368	0.3922	0.3833	0.3387	0.3387	0.3298	0.3565	0.3833	0.4011	0.4189 (22b)
Effective ac	0.6033	0.5993	0.5954	0.5769	0.5735	0.5574	0.5574	0.5544	0.5636	0.5735	0.5804	0.5878 (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)			12.9900	1.1450	14.8740		(27)
Ground Floor			42.1700	0.1100	4.6387	140.0000	5903.8000 (28a)
Brick and Block	75.8400	12.9100	62.9300	0.2400	15.1032	42.2200	2656.9046 (29a)
External Cladding	18.7300	2.2000	16.5300	0.2400	3.9672	42.2200	697.8966 (29a)
Pitched Roof	42.1700		42.1700	0.1000	4.2170	9.0000	379.5300 (30)
Total net area of external elements Aum(A, m ²)			178.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.1321		(33)
Party Wall 1			42.7700	0.0000	0.0000	110.0000	4704.7000 (32)
Ground Floor Stud			69.4000			9.0000	624.6000 (32c)
First Floor Stud			91.5800			9.0000	824.2200 (32c)
Internal Floor 1			42.1700			18.0000	759.0600 (32d)
Internal Ceiling 1			42.1700			18.0000	759.0600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 17309.7712 (34)
205.2380 (35)
6.3275 (36)
(33) + (36) = 51.4596 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.4834	42.2009	41.9240	40.6233	40.3799	39.2470	39.2470	39.0372	39.6834	40.3799	40.8722	41.3869 (38)
Heat transfer coeff	93.9430	93.6605	93.3836	92.0828	91.8395	90.7066	90.7066	90.4968	91.1430	91.8395	92.3318	92.8465 (39)
Average = Sum(39)m / 12 =												92.0817 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1139	1.1105	1.1072	1.0918	1.0889	1.0755	1.0755	1.0730	1.0807	1.0889	1.0948	1.1009 (40)
HLP (average)												1.0918 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.5401 (42)
94.5267 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9794	100.1983	96.4172	92.6361	88.8551	85.0740	85.0740	88.8551	92.6361	96.4172	100.1983	103.9794 (44)
Energy conte	154.1984	134.8629	139.1664	121.3287	116.4177	100.4596	93.0906	106.8229	108.0987	125.9786	137.5155	149.3329 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum (45)m = 1487.2728 (45)
Distribution loss (46)m = 0.15 x (45)m												
23.1298	20.2294	20.8750	18.1993	17.4627	15.0689	13.9636	16.0234	16.2148	18.8968	20.6273	22.3999	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	27.5592	24.8900	27.5310	26.6133	27.4788	26.5675	27.4376	27.4643	26.5924	27.5094	26.6560	27.5512 (61)
Total heat required for water heating calculated for each month												
181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(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												
181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(64)
Heat gains from water heating, kWh/month												
58.1608	51.0644	53.1556	46.9951	45.5786	40.0447	37.8120	42.3847	42.5909	48.7652	52.3879	56.5410	(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	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3949	19.0027	15.4541	11.6997	8.7457	7.3835	7.9781	10.3702	13.9189	17.6732	20.6273	21.9895 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.2717	230.6404	224.6713	211.9636	195.9225	180.8461	170.7742	168.4054	174.3746	187.0822	203.1233	218.1997 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028 (71)
Water heating gains (Table 5)	78.1731	75.9887	71.4457	65.2710	61.2616	55.6176	50.8226	56.9687	59.1540	65.5447	72.7610	75.9959 (72)
Total internal gains	391.9407	389.7329	375.6721	353.0354	330.0308	307.9483	293.6759	299.8454	311.5486	334.4012	360.6126	380.2862 (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	3.6700	11.2829	0.6300	0.7000		0.7700		12.6549	(75)
														Southwest	8.0000	36.7938	0.6300	0.7000		0.7700		89.9574	(79)
														Northwest	1.3200	11.2829	0.6300	0.7000		0.7700		4.5516	(81)
Solar gains	107.1640	188.2552	272.7600	363.4084	430.2732	437.3779	417.4274	365.9814	303.9061	212.1553	129.3986		91.0365	(83)									
Total gains	499.1047	577.9881	648.4320	716.4438	760.3040	745.3262	711.1034	665.8268	615.4547	546.5565	490.0112		471.3228	(84)									

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
51.1828	51.3372	51.4895	52.2168	52.3551	53.0090	53.0090	53.1319	52.7552	52.3551	52.0760	51.7873	
alpha	4.4122	4.4225	4.4326	4.4811	4.4903	4.5339	4.5339	4.5421	4.5170	4.4903	4.4717	4.4525
util living area	0.9956	0.9911	0.9797	0.9458	0.8620	0.7048	0.5425	0.5952	0.8275	0.9634	0.9916	0.9966 (86)
MIT	19.5988	19.7768	20.0591	20.4266	20.7388	20.9273	20.9825	20.9737	20.8425	20.4368	19.9532	19.5711 (87)
Th 2	19.9895	19.9923	19.9949	20.0075	20.0099	20.0209	20.0209	20.0229	20.0167	20.0099	20.0051	20.0001 (88)
util rest of house	0.9944	0.9886	0.9738	0.9292	0.8194	0.6219	0.4306	0.4822	0.7609	0.9489	0.9888	0.9957 (89)
MIT 2	18.7116	18.8906	19.1718	19.5385	19.8257	19.9837	20.0155	20.0140	19.9232	19.5557	19.0771	18.6923 (90)
Living area fraction												
MIT	18.9018	19.0806	19.3620	19.7289	20.0214	20.1860	20.2228	20.2197	20.1203	19.7446	19.2650	18.8807 (92)
Temperature adjustment												
adjusted MIT	18.9018	19.0806	19.3620	19.7289	20.0214	20.1860	20.2228	20.2197	20.1203	19.7446	19.2650	18.8807 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9926	0.9856	0.9690	0.9235	0.8200	0.6369	0.4545	0.5061	0.7688	0.9440	0.9860	0.9942 (94)
Useful gains	495.4210	569.6582	628.3136	661.6524	623.4225	474.7103	323.1960	336.9787	473.1899	515.9265	483.1723	468.5881 (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	1371.7396	1328.1617	1201.1031	997.1564	764.2356	506.6865	328.6092	345.6716	548.7056	839.8367	1123.2124	1363.0522 (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	651.9811	509.7143	426.1554	241.5629	104.7649	0.0000	0.0000	0.0000	0.0000	240.9892	460.8288	665.4813 (98)
Space heating												3301.4780 (98)
Space heating per m2												(98) / (4) = 39.1449 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													3639.9978	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	651.9811	509.7143	426.1554	241.5629	104.7649	0.0000	0.0000	0.0000	0.0000	240.9892	460.8288	665.4813	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	718.8325	561.9783	469.8516	266.3318	115.5070	0.0000	0.0000	0.0000	0.0000	265.6993	508.0803	733.7170	(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	181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(64)	
Efficiency of water heater (217)m	90.0745	90.0158	89.8948	89.6157	89.0583	87.9000	87.9000	87.9000	87.9000	89.5896	89.9474	90.0973	(216)	
Fuel for water heating, kWh/month	201.7859	177.4721	185.4361	165.0847	161.5756	144.5132	137.1197	152.7727	153.2322	171.3235	182.5194	196.3255	(219)	
Water heating fuel used												2029.1606	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3639.9978	(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)													377.8399	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.65 * 1029 * 1.00) =										-535.1771			-535.1771	(233)
Total delivered energy for all uses													5586.8212	(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	3639.9978	0.2160	786.2395	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2029.1606	0.2160	438.2987	(264)
Space and water heating			1224.5382	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	377.8399	0.5190	196.0989	(268)
Energy saving/generation technologies				
PV Unit	-535.1771	0.5190	-277.7569	(269)
Total CO2, kg/year			1181.8052	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.0100	(273)

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

DER			14.0100	ZC1
Total Floor Area		TFA	84.3400	
Assumed number of occupants		N	2.5401	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.0385	ZC2
CO2 emissions from cooking, equation (L16)			2.1338	ZC3
Total CO2 emissions			32.1823	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			32.1823	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	42.1700 (1b)	x 2.3900 (2b)	= 100.7863 (1b) - (3b)
First floor	42.1700 (1c)	x 2.6700 (2c)	= 112.5939 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.3802 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1406 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3906 (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) =	0.3320 (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	0.4233	0.4150	0.4067	0.3652	0.3569	0.3154	0.3154	0.3071	0.3320	0.3569	0.3735	0.3901 (22b)
Effective ac	0.5896	0.5861	0.5827	0.5667	0.5637	0.5497	0.5497	0.5472	0.5551	0.5637	0.5698	0.5761 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Semi-glazed door			2.1200	1.2000	2.5440		(26a)
TER Opening Type (Uw = 1.40)			12.9900	1.3258	17.2216		(27)
Ground Floor			42.1700	0.1300	5.4821		(28a)
Brick and Block	75.8400	12.9100	62.9300	0.1800	11.3274		(29a)
External Cladding	18.7300	2.2000	16.5300	0.1800	2.9754		(29a)
Pitched Roof	42.1700		42.1700	0.1300	5.4821		(30)
Total net area of external elements Aum(A, m ²)			178.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0326		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1928 (36)
Total fabric heat loss						(33) + (36) =	55.2254 (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	41.5165	41.2716	41.0314	39.9036	39.6925	38.7102	38.7102	38.5283	39.0886	39.6925	40.1194	40.5657 (38)
Heat transfer coeff	96.7419	96.4970	96.2568	95.1290	94.9179	93.9356	93.9356	93.7537	94.3140	94.9179	95.3448	95.7911 (39)
Average = Sum(39)m / 12 =												95.1279 (39)
HLP	1.1470	1.1441	1.1413	1.1279	1.1254	1.1138	1.1138	1.1116	1.1183	1.1254	1.1305	1.1358 (40)
HLP (average)												1.1279 (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												2.5401 (42)
Average daily hot water use (litres/day)												94.5267 (43)
Daily hot water use	103.9794	100.1983	96.4172	92.6361	88.8551	85.0740	85.0740	88.8551	92.6361	96.4172	100.1983	103.9794 (44)
Energy conte	154.1984	134.8629	139.1664	121.3287	116.4177	100.4596	93.0906	106.8229	108.0987	125.9786	137.5155	149.3329 (45)
Energy content (annual)										Total = Sum(45)m =		1487.2728 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1298	20.2294	20.8750	18.1993	17.4627	15.0689	13.9636	16.0234	16.2148	18.8968	20.6273	22.3999 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	49.1332	45.6836	45.2796	41.9543	43.3528	45.2796	45.6836	49.1332	49.3151	50.9589	50.9589	50.9589	(61)
Total heat required for water heating calculated for each month	205.1573	180.8903	188.2996	167.0122	161.6973	142.4140	136.4434	152.1024	153.7822	175.1117	186.8305	200.2918	200.2918	200.2918	(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	0.0000	0.0000	(63)
Output from w/h	205.1573	180.8903	188.2996	167.0122	161.6973	142.4140	136.4434	152.1024	153.7822	175.1117	186.8305	200.2918	200.2918	200.2918	(64)
Heat gains from water heating, kWh/month	64.0107	56.3488	58.5561	51.7627	50.0288	43.8914	41.7908	46.8385	47.3637	54.1712	58.0527	62.3929	62.3929	62.3929	(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	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3949	19.0027	15.4541	11.6997	8.7457	7.3835	7.9781	10.3702	13.9189	17.6732	20.6273	21.9895	21.9895	21.9895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.2717	230.6404	224.6713	211.9636	195.9225	180.8461	170.7742	168.4054	174.3746	187.0822	203.1233	218.1997	218.1997	218.1997	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	(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	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	(71)
Water heating gains (Table 5)	86.0359	83.8523	78.7045	71.8926	67.2430	60.9603	56.1705	62.9550	65.7829	72.8107	80.6287	83.8614	83.8614	83.8614	(72)
Total internal gains	399.8035	397.5965	382.9308	359.6570	336.0122	313.2909	299.0238	305.8317	318.1775	341.6672	368.4804	388.1517	388.1517	388.1517	(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				3.6700	11.2829	0.6300	0.7000	0.7700			12.6549 (75)	
Southwest				8.0000	36.7938	0.6300	0.7000	0.7700			89.9574 (79)	
Northwest				1.3200	11.2829	0.6300	0.7000	0.7700			4.5516 (81)	
Solar gains	107.1640	188.2552	272.7600	363.4084	430.2732	437.3779	417.4274	365.9814	303.9061	212.1553	129.3986	91.0365 (83)
Total gains	506.9674	585.8517	655.6908	723.0654	766.2855	750.6688	716.4512	671.8131	622.0836	553.8225	497.8789	479.1883 (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	60.5419	60.6956	60.8471	61.5685	61.7053	62.3506	62.3506	62.4716	62.1005	61.7053	61.4291	61.1429	61.1429	61.1429	61.1429	(86)
alpha	5.0361	5.0464	5.0565	5.1046	5.1137	5.1567	5.1567	5.1648	5.1400	5.1137	5.0953	5.0762	5.0762	5.0762	5.0762	(87)
util living area	0.9980	0.9954	0.9883	0.9632	0.8895	0.7328	0.5621	0.6170	0.8554	0.9765	0.9957	0.9985	0.9985	0.9985	0.9985	(88)
MIT	19.7637	19.9182	20.1660	20.4917	20.7750	20.9427	20.9881	20.9812	20.8671	20.5007	20.0730	19.7375	19.7375	19.7375	19.7375	(89)
Th 2	19.9626	19.9649	19.9673	19.9781	19.9801	19.9896	19.9896	19.9914	19.9859	19.9801	19.9760	19.9717	19.9717	19.9717	19.9717	(90)
util rest of house	0.9973	0.9939	0.9840	0.9490	0.8468	0.6428	0.4406	0.4940	0.7860	0.9647	0.9940	0.9980	0.9980	0.9980	0.9980	(91)
MIT 2	18.3151	18.5421	18.9036	19.3760	19.7557	19.9507	19.9851	19.9835	19.8774	19.3968	18.7766	18.2833	18.2833	18.2833	18.2833	(92)
Living area fraction	18.6256	18.8371	19.1743	19.6152	19.9742	20.1633	20.2001	20.1974	20.0896	19.6334	19.0545	18.5950	18.5950	18.5950	18.5950	(93)
Temperature adjustment	18.6256	18.8371	19.1743	19.6152	19.9742	20.1633	20.2001	20.1974	20.0896	19.6334	19.0545	18.5950	18.5950	18.5950	18.5950	(94)
adjusted MIT	18.6256	18.8371	19.1743	19.6152	19.9742	20.1633	20.2001	20.1974	20.0896	19.6334	19.0545	18.5950	18.5950	18.5950	18.5950	(95)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Useful gains	0.9960	0.9914	0.9795	0.9426	0.8465	0.6596	0.4668	0.5204	0.7943	0.9593	0.9917	0.9969	0.9969	0.9969	(96)
Ext temp.	504.9319	580.8284	642.2454	681.5489	648.6940	495.1056	334.4252	349.5884	494.1035	531.2882	493.7316	477.7239	477.7239	477.7239	(97)
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	4.2000	4.2000	(98)
Month fracti	1385.8878	1344.8917	1219.9836	1019.3274	785.3675	522.5938	338.1817	356.0159	564.9023	857.4363	1139.8033	1378.9166	1378.9166	1378.9166	(99)
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	1.0000	1.0000	(100)
Space heating per m2	655.4312	513.4505	429.8372	243.2006	101.6851	0.0000	0.0000	0.0000	0.0000	242.6542	465.1717	670.4874	670.4874	670.4874	(101)
Space heating per m2															(102)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3556.6572 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	655.4312	513.4505	429.8372	243.2006	101.6851	0.0000	0.0000	0.0000	0.0000	242.6542	465.1717	670.4874	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	701.7465	549.7329	460.2112	260.3860	108.8705	0.0000	0.0000	0.0000	0.0000	259.8011	498.0425	717.8666	(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	205.1573	180.8903	188.2996	167.0122	161.6973	142.4140	136.4434	152.1024	153.7822	175.1117	186.8305	200.2918	(64)
Efficiency of water heater (217)m	87.7683	87.5318	87.0641	85.9962	83.9198	80.3000	80.3000	80.3000	80.3000	85.8727	87.2552	87.8582	(216)
Fuel for water heating, kWh/month	233.7487	206.6567	216.2769	194.2088	192.6807	177.3524	169.9171	189.4177	191.5096	203.9202	214.1197	227.9717	(219)
Water heating fuel used												2417.7802	(219)
Annual totals kWh/year													
Space heating fuel - main system													3556.6572 (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)													377.8399 (232)
Total delivered energy for all uses													6427.2774 (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	3556.6572	0.2160	768.2380 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2417.7802	0.2160	522.2405 (264)
Space and water heating			1290.4785 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	377.8399	0.5190	196.0989 (268)
Total CO2, kg/m2/year			1525.5024 (272)
Emissions per m2 for space and water heating			15.3009 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3251 (272b)
Emissions per m2 for pumps and fans			0.4615 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3009 * 1.00) + 2.3251 + 0.4615, rounded to 2 d.p.			18.0900 (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	42.1700 (1b)	x 2.3900 (2b)	= 100.7863 (1b) - (3b)
First floor	42.1700 (1c)	x 2.6700 (2c)	= 112.5939 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.3802 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1406 (8)
Pressure test					Yes
Measured/design AP50					4.6400
Infiltration rate					0.3726 (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) =	0.3167 (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	0.4038	0.3959	0.3880	0.3484	0.3405	0.3009	0.3009	0.2930	0.3167	0.3405	0.3563	0.3721 (22b)
Effective ac	0.5815	0.5784	0.5753	0.5607	0.5580	0.5453	0.5453	0.5429	0.5502	0.5580	0.5635	0.5692 (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)			12.9900	1.1450	14.8740		(27)
Ground Floor			42.1700	0.1100	4.6387	140.0000	5903.8000 (28a)
Brick and Block	75.8400	12.9100	62.9300	0.2400	15.1032	42.2200	2656.9046 (29a)
External Cladding	18.7300	2.2000	16.5300	0.2400	3.9672	42.2200	697.8966 (29a)
Pitched Roof	42.1700		42.1700	0.1000	4.2170	9.0000	379.5300 (30)
Total net area of external elements Aum(A, m ²)			178.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.1321		(33)
Party Wall 1			42.7700	0.0000	0.0000	110.0000	4704.7000 (32)
Ground Floor Stud			69.4000			9.0000	624.6000 (32c)
First Floor Stud			91.5800			9.0000	824.2200 (32c)
Internal Floor 1			42.1700			18.0000	759.0600 (32d)
Internal Ceiling 1			42.1700			9.0000	379.5300 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 16930.2412 (34)
200.7380 (35)
6.3275 (36)
(33) + (36) = 51.4596 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.9485	40.7256	40.5071	39.4807	39.2887	38.3948	38.3948	38.2293	38.7391	39.2887	39.6772	40.0833 (38)
Heat transfer coeff	92.4081	92.1852	91.9666	90.9403	90.7483	89.8544	89.8544	89.6889	90.1987	90.7483	91.1368	91.5429 (39)
Average = Sum(39)m / 12 =												90.9394 (39)
HLP	1.0957	1.0930	1.0904	1.0783	1.0760	1.0654	1.0654	1.0634	1.0695	1.0760	1.0806	1.0854 (40)
HLP (average)												1.0782 (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												2.5401 (42)
Average daily hot water use (litres/day)												94.5267 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	103.9794	100.1983	96.4172	92.6361	88.8551	85.0740	85.0740	88.8551	92.6361	96.4172	100.1983	103.9794 (44)
	154.1984	134.8629	139.1664	121.3287	116.4177	100.4596	93.0906	106.8229	108.0987	125.9786	137.5155	149.3329 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1487.2728 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.7672	28.6584	29.5729	25.7823	24.7388	21.3477	19.7818	22.6999	22.9710	26.7704	29.2220	31.7332 (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	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3949	19.0027	15.4541	11.6997	8.7457	7.3835	7.9781	10.3702	13.9189	17.6732	20.6273	21.9895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.2717	230.6404	224.6713	211.9636	195.9225	180.8461	170.7742	168.4054	174.3746	187.0822	203.1233	218.1997	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	(71)
Water heating gains (Table 5)	44.0419	42.6464	39.7485	35.8088	33.2510	29.6495	26.5884	30.5106	31.9041	35.9818	40.5862	42.6522	(72)
Total internal gains	354.8095	353.3906	340.9748	320.5732	299.0203	278.9802	266.4417	270.3873	281.2987	301.8383	325.4378	343.9425	(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				3.6700	11.2829	0.6300	0.7000		0.7700		12.6549 (75)	
Southwest				8.0000	36.7938	0.6300	0.7000		0.7700		89.9574 (79)	
Northwest				1.3200	11.2829	0.6300	0.7000		0.7700		4.5516 (81)	
Solar gains	107.1640	188.2552	272.7600	363.4084	430.2732	437.3779	417.4274	365.9814	303.9061	212.1553	129.3986	91.0365 (83)
Total gains	461.9734	541.6458	613.7348	683.9816	729.2935	716.3581	683.8692	636.3687	585.2048	513.9936	454.8364	434.9790 (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	50.8921	51.0152	51.1364	51.7135	51.8229	52.3385	52.3385	52.4351	52.1387	51.8229	51.6021	51.3731	
alpha	4.3928	4.4010	4.4091	4.4476	4.4549	4.4892	4.4892	4.4957	4.4759	4.4549	4.4401	4.4249	
util living area	0.9965	0.9924	0.9821	0.9506	0.8709	0.7185	0.5562	0.6125	0.8416	0.9685	0.9932	0.9973	(86)
MIT	19.5548	19.7359	20.0236	20.3969	20.7201	20.9189	20.9799	20.9694	20.8257	20.4022	19.9086	19.5231	(87)
Th 2	20.0044	20.0065	20.0087	20.0186	20.0205	20.0292	20.0292	20.0308	20.0258	20.0205	20.0167	20.0128	(88)
util rest of house	0.9955	0.9904	0.9769	0.9355	0.8306	0.6369	0.4436	0.4991	0.7785	0.9559	0.9910	0.9966	(89)
MIT 2	18.6813	18.8632	19.1498	19.5212	19.8203	19.9868	20.0228	20.0200	19.9199	19.5332	19.0439	18.6563	(90)
Living area fraction	18.8686	19.0503	19.3371	19.7089	20.0132	20.1866	20.2279	20.2235	20.1141	19.7195	19.2293	18.8421	(91)
MIT	18.8686	19.0503	19.3371	19.7089	20.0132	20.1866	20.2279	20.2235	20.1141	19.7195	19.2293	18.8421	(92)
Temperature adjustment	18.8686	19.0503	19.3371	19.7089	20.0132	20.1866	20.2279	20.2235	20.1141	19.7195	19.2293	18.8421	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	459.2005	534.9689	596.7735	635.8391	605.4799	466.5073	319.7503	332.7743	459.4425	488.7822	449.6044	432.9544	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1346.2530	1304.4439	1180.5846	982.9658	754.4093	501.9811	325.9870	342.9294	542.4640	827.5757	1105.4241	1340.3824	(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	659.9670	517.0872	434.3555	249.9312	110.8035	0.0000	0.0000	0.0000	0.0000	252.0624	472.1902	675.1265	(98)
Space heating													3371.5234 (98)
Space heating per m2													(98) / (4) = 39.9754 (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	844.6316	664.9227	681.6356	0.0000	0.0000	0.0000	0.0000	(100)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8560	0.9152	0.8917	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	722.9721	608.5527	607.8440	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	932.8306	892.9046	839.1399	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	151.0981	211.5578	172.0842	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												534.7401 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	37.7745	52.8895	43.0210	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												133.6850 (107)
Space cooling per m2												1.5851 (108)
Energy for space heating												39.9754 (99)
Energy for space cooling												1.5851 (108)
Total												41.5605 (109)
Dwelling Fabric Energy Efficiency (DFEE)												41.6 (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	42.1700 (1b)	x 2.3900 (2b)	= 100.7863 (1b) - (3b)
First floor	42.1700 (1c)	x 2.6700 (2c)	= 112.5939 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.3802 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1406 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3906 (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) =	0.3320 (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	0.4233	0.4150	0.4067	0.3652	0.3569	0.3154	0.3154	0.3071	0.3320	0.3569	0.3735	0.3901 (22b)
Effective ac	0.5896	0.5861	0.5827	0.5667	0.5637	0.5497	0.5497	0.5472	0.5551	0.5637	0.5698	0.5761 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Semi-glazed door			2.1200	1.2000	2.5440		(26a)
TER Opening Type (Uw = 1.40)			12.9900	1.3258	17.2216		(27)
Ground Floor			42.1700	0.1300	5.4821		(28a)
Brick and Block	75.8400	12.9100	62.9300	0.1800	11.3274		(29a)
External Cladding	18.7300	2.2000	16.5300	0.1800	2.9754		(29a)
Pitched Roof	42.1700		42.1700	0.1300	5.4821		(30)
Total net area of external elements Aum(A, m ²)			178.9100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.0326	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1928 (36)
Total fabric heat loss						(33) + (36) =	55.2254 (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	41.5165	41.2716	41.0314	39.9036	39.6925	38.7102	38.7102	38.5283	39.0886	39.6925	40.1194	40.5657 (38)
Heat transfer coeff	96.7419	96.4970	96.2568	95.1290	94.9179	93.9356	93.9356	93.7537	94.3140	94.9179	95.3448	95.7911 (39)
Average = Sum(39)m / 12 =												95.1279 (39)
HLP	1.1470	1.1441	1.1413	1.1279	1.1254	1.1138	1.1138	1.1116	1.1183	1.1254	1.1305	1.1358 (40)
HLP (average)												1.1279 (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												2.5401 (42)
Average daily hot water use (litres/day)												94.5267 (43)
Daily hot water use	103.9794	100.1983	96.4172	92.6361	88.8551	85.0740	85.0740	88.8551	92.6361	96.4172	100.1983	103.9794 (44)
Energy conte	154.1984	134.8629	139.1664	121.3287	116.4177	100.4596	93.0906	106.8229	108.0987	125.9786	137.5155	149.3329 (45)
Energy content (annual)										Total = Sum(45)m =		1487.2728 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.7672	28.6584	29.5729	25.7823	24.7388	21.3477	19.7818	22.6999	22.9710	26.7704	29.2220	31.7332 (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	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	127.0035	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3949	19.0027	15.4541	11.6997	8.7457	7.3835	7.9781	10.3702	13.9189	17.6732	20.6273	21.9895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.2717	230.6404	224.6713	211.9636	195.9225	180.8461	170.7742	168.4054	174.3746	187.0822	203.1233	218.1997	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	35.7004	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	(71)
Water heating gains (Table 5)	44.0419	42.6464	39.7485	35.8088	33.2510	29.6495	26.5884	30.5106	31.9041	35.9818	40.5862	42.6522	(72)
Total internal gains	354.8095	353.3906	340.9748	320.5732	299.0203	278.9802	266.4417	270.3873	281.2987	301.8383	325.4378	343.9425	(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					3.6700	11.2829	0.6300	0.7000	0.7700		12.6549 (75)		
Southwest					8.0000	36.7938	0.6300	0.7000	0.7700		89.9574 (79)		
Northwest					1.3200	11.2829	0.6300	0.7000	0.7700		4.5516 (81)		
Solar gains	107.1640	188.2552	272.7600	363.4084	430.2732	437.3779	417.4274	365.9814	303.9061	212.1553	129.3986	91.0365	(83)
Total gains	461.9734	541.6458	613.7348	683.9816	729.2935	716.3581	683.8692	636.3687	585.2048	513.9936	454.8364	434.9790	(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	60.5419	60.6956	60.8471	61.5685	61.7053	62.3506	62.3506	62.4716	62.1005	61.7053	61.4291	61.1429	
alpha	5.0361	5.0464	5.0565	5.1046	5.1137	5.1567	5.1567	5.1648	5.1400	5.1137	5.0953	5.0762	
util living area	0.9987	0.9968	0.9911	0.9703	0.9050	0.7564	0.5857	0.6455	0.8781	0.9826	0.9972	0.9990	(86)
MIT	19.7140	19.8700	20.1218	20.4551	20.7508	20.9335	20.9857	20.9770	20.8467	20.4608	20.0258	19.6885	(87)
Th 2	19.9626	19.9649	19.9673	19.9781	19.9801	19.9896	19.9896	19.9914	19.9859	19.9801	19.9760	19.9717	(88)
util rest of house	0.9982	0.9957	0.9879	0.9584	0.8660	0.6675	0.4607	0.5196	0.8143	0.9736	0.9960	0.9987	(89)
MIT 2	18.7882	18.9456	19.1977	19.5328	19.8075	19.9581	19.9859	19.9846	19.8979	19.5440	19.1103	18.7700	(90)
Living area fraction	18.9867	19.1438	19.3958	19.7305	20.0097	20.1672	20.2002	20.1973	20.1013	19.7405	19.3066	18.9669	(92)
MIT	18.9867	19.1438	19.3958	19.7305	20.0097	20.1672	20.2002	20.1973	20.1013	19.7405	19.3066	18.9669	(93)
Temperature adjustment												0.0000	
adjusted MIT	18.9867	19.1438	19.3958	19.7305	20.0097	20.1672	20.2002	20.1973	20.1013	19.7405	19.3066	18.9669	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9976	0.9945	0.9854	0.9548	0.8674	0.6846	0.4878	0.5468	0.8229	0.9708	0.9949	0.9983	(94)
Useful gains	460.8843	538.6479	604.7988	653.0407	632.5662	490.4023	333.5994	347.9793	481.5405	498.9773	452.5192	434.2214	(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	1420.8184	1374.4819	1241.3049	1030.2915	788.7416	522.9579	338.1869	356.0140	566.0063	867.6000	1163.8352	1414.5401	(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	714.1910	561.6805	473.5605	271.6205	116.1945	0.0000	0.0000	0.0000	0.0000	274.2553	512.1475	729.3571	(98)
Space heating												3653.0069	(98)
Space heating per m2											(98) / (4) =	43.3129	(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	882.9946	695.1234	712.5280	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8597	0.9225	0.8979	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	759.0813	641.2610	639.8017	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	932.8306	892.9046	839.1399	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	125.0995	187.2228	148.3077	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												460.6300 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	31.2749	46.8057	37.0769	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												115.1575 (107)
Space cooling per m2												1.3654 (108)
Energy for space heating												43.3129 (99)
Energy for space cooling												1.3654 (108)
Total												44.6783 (109)
Target Fabric Energy Efficiency (TFEE)												51.4 (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	42.1700 (1b)	x 2.3900 (2b)	= 100.7863 (1b) - (3b)
First floor	42.1700 (1c)	x 2.6700 (2c)	= 112.5939 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.3802 (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) = 0.1875 (8)
Pressure test					Yes
Measured/design AP50					4.6400
Infiltration rate					0.4195 (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) =	0.3565 (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	0.3744	0.3476	0.3565	0.3387	0.3387	0.3298	0.3209	0.3120	0.3031	0.3298	0.3120	0.3298 (22b)
Effective ac	0.5701	0.5604	0.5636	0.5574	0.5574	0.5544	0.5515	0.5487	0.5459	0.5544	0.5487	0.5544 (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)			12.9900	1.1450	14.8740		(27)
Ground Floor			42.1700	0.1100	4.6387	140.0000	5903.8000 (28a)
Brick and Block	75.8400	12.9100	62.9300	0.2400	15.1032	42.2200	2656.9046 (29a)
External Cladding	18.7300	2.2000	16.5300	0.2400	3.9672	42.2200	697.8966 (29a)
Pitched Roof	42.1700		42.1700	0.1000	4.2170	9.0000	379.5300 (30)
Total net area of external elements Aum(A, m ²)			178.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.1321		(33)
Party Wall 1			42.7700	0.0000	0.0000	110.0000	4704.7000 (32)
Ground Floor Stud			69.4000			9.0000	624.6000 (32c)
First Floor Stud			91.5800			9.0000	824.2200 (32c)
Internal Floor 1			42.1700			18.0000	759.0600 (32d)
Internal Ceiling 1			42.1700			18.0000	759.0600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 17309.7712 (34)
205.2380 (35)
6.3275 (36)
(33) + (36) = 51.4596 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.1421	39.4624	39.6834	39.2470	39.2470	39.0372	38.8330	38.6344	38.4414	39.0372	38.6344	39.0372 (38)
Heat transfer coeff	91.6017	90.9220	91.1430	90.7066	90.7066	90.4968	90.2926	90.0940	89.9010	90.4968	90.0940	90.4968 (39)
Average = Sum(39)m / 12 =												90.5793 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0861	1.0780	1.0807	1.0755	1.0755	1.0730	1.0706	1.0682	1.0659	1.0730	1.0682	1.0730 (40)
HLP (average)												1.0740 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.5401 (42)
94.5267 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9794	100.1983	96.4172	92.6361	88.8551	85.0740	85.0740	88.8551	92.6361	96.4172	100.1983	103.9794 (44)
Energy conte	154.1984	134.8629	139.1664	121.3287	116.4177	100.4596	93.0906	106.8229	108.0987	125.9786	137.5155	149.3329 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)												Total = Sum(45)m = 1487.2728 (45)
Distribution loss (46)m = 0.15 x (45)m												
23.1298	20.2294	20.8750	18.1993	17.4627	15.0689	13.9636	16.0234	16.2148	18.8968	20.6273	22.3999	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	27.5592	24.8900	27.5310	26.6133	27.4788	26.5675	27.4376	27.4643	26.5924	27.5094	26.6560	27.5512 (61)
Total heat required for water heating calculated for each month												
181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(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												
181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(64)
RHI water heating demand												
Heat gains from water heating, kWh/month												
58.1608	51.0644	53.1556	46.9951	45.5786	40.0447	37.8120	42.3847	42.5909	48.7652	52.3879	56.5410	(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	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.4872	47.5068	38.6351	29.2493	21.8642	18.4587	19.9452	25.9256	34.7973	44.1831	51.5682	54.9737 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7040	344.2394	335.3302	316.3636	292.4217	269.9196	254.8868	251.3514	260.2606	279.2272	303.1692	325.6712 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028 (71)
Water heating gains (Table 5)	78.1731	75.9887	71.4457	65.2710	61.2616	55.6176	50.8226	56.9687	59.1540	65.5447	72.7610	75.9959 (72)
Total internal gains	578.9461	574.3169	551.9930	517.4658	482.1293	450.5778	432.2366	440.8275	460.7938	495.5369	534.0802	563.2228 (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				3.6700	14.6176	0.6300	0.7000		0.7700		16.3952 (75)	
Southwest				8.0000	45.1778	0.6300	0.7000		0.7700		110.4554 (79)	
Northwest				1.3200	14.6176	0.6300	0.7000		0.7700		5.8969 (81)	
Solar gains	132.7475	198.9556	292.1459	394.3758	445.8917	493.1673	466.6684	417.7999	344.7523	242.3264	159.8622	110.8011 (83)
Total gains	711.6936	773.2725	844.1388	911.8416	928.0210	943.7452	898.9050	858.6274	805.5461	737.8633	693.9424	674.0239 (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	52.4910	52.8835	52.7552	53.0090	53.0090	53.1319	53.2521	53.3695	53.4841	53.1319	53.3695	53.1319
alpha	4.4994	4.5256	4.5170	4.5339	4.5339	4.5421	4.5501	4.5580	4.5656	4.5421	4.5580	4.5421
util living area	0.9801	0.9704	0.9417	0.8697	0.7362	0.5301	0.3884	0.4051	0.6544	0.8795	0.9614	0.9832 (86)
MIT	19.9780	20.1081	20.3666	20.6704	20.8843	20.9794	20.9960	20.9953	20.9482	20.7101	20.3227	19.9645 (87)
Th 2	20.0122	20.0188	20.0167	20.0209	20.0209	20.0229	20.0249	20.0269	20.0287	20.0229	20.0269	20.0229 (88)
util rest of house	0.9750	0.9629	0.9268	0.8374	0.6761	0.4460	0.2930	0.3061	0.5709	0.8417	0.9499	0.9787 (89)
MIT 2	19.1043	19.2368	19.4847	19.7696	19.9487	20.0144	20.0240	20.0258	20.0034	19.8129	19.4548	19.1001 (90)
Living area fraction	fLA = Living area / (4) = 0.2144 (91)											
MIT	19.2916	19.4236	19.6738	19.9627	20.1493	20.2213	20.2324	20.2336	20.2060	20.0052	19.6408	19.2854 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2916	19.4236	19.6738	19.9627	20.1493	20.2213	20.2324	20.2336	20.2060	20.0052	19.6408	19.2854 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9703	0.9573	0.9207	0.8353	0.6846	0.4636	0.3135	0.3274	0.5870	0.8409	0.9443	0.9745	(94)
Useful gains	690.5347	740.2884	777.1579	761.6415	635.2896	437.4734	281.8223	281.1252	472.8644	620.4961	655.2827	656.8113	(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	1318.2975	1284.1451	1155.1271	949.0328	693.8430	445.3593	282.8295	282.3183	494.9928	778.7473	1057.7777	1292.7814	(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	467.0555	365.4717	281.2091	134.9217	43.5637	0.0000	0.0000	0.0000	0.0000	117.7389	289.7964	473.1617	(98)
Space heating												2172.9189	(98)
RHI space heating demand												2173	(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	42.1700 (1b)	x 2.3900 (2b)	= 100.7863 (1b) - (3b)
First floor	42.1700 (1c)	x 2.6700 (2c)	= 112.5939 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.3802 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1875 (8)
Pressure test					Yes
Measured/design AP50					4.6400
Infiltration rate					0.4195 (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) =	0.3565 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4546	0.4457	0.4368	0.3922	0.3833	0.3387	0.3387	0.3298	0.3565	0.3833	0.4011	0.4189 (22b)
	0.6033	0.5993	0.5954	0.5769	0.5735	0.5574	0.5574	0.5544	0.5636	0.5735	0.5804	0.5878 (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)			12.9900	1.1450	14.8740		(27)
Ground Floor			42.1700	0.1100	4.6387	140.0000	5903.8000 (28a)
Brick and Block	75.8400	12.9100	62.9300	0.2400	15.1032	42.2200	2656.9046 (29a)
External Cladding	18.7300	2.2000	16.5300	0.2400	3.9672	42.2200	697.8966 (29a)
Pitched Roof	42.1700		42.1700	0.1000	4.2170	9.0000	379.5300 (30)
Total net area of external elements Aum(A, m ²)			178.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.1321		(33)
Party Wall 1			42.7700	0.0000	0.0000	110.0000	4704.7000 (32)
Ground Floor Stud			69.4000			9.0000	624.6000 (32c)
First Floor Stud			91.5800			9.0000	824.2200 (32c)
Internal Floor 1			42.1700			18.0000	759.0600 (32d)
Internal Ceiling 1			42.1700			18.0000	759.0600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 17309.7712 (34)
205.2380 (35)
6.3275 (36)
(33) + (36) = 51.4596 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.4834	42.2009	41.9240	40.6233	40.3799	39.2470	39.2470	39.0372	39.6834	40.3799	40.8722	41.3869 (38)
Heat transfer coeff	93.9430	93.6605	93.3836	92.0828	91.8395	90.7066	90.7066	90.4968	91.1430	91.8395	92.3318	92.8465 (39)
Average = Sum(39)m / 12 =												92.0817 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1139	1.1105	1.1072	1.0918	1.0889	1.0755	1.0755	1.0730	1.0807	1.0889	1.0948	1.1009 (40)
HLP (average)												1.0918 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.5401 (42)
94.5267 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9794	100.1983	96.4172	92.6361	88.8551	85.0740	85.0740	88.8551	92.6361	96.4172	100.1983	103.9794 (44)
Energy conte	154.1984	134.8629	139.1664	121.3287	116.4177	100.4596	93.0906	106.8229	108.0987	125.9786	137.5155	149.3329 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)												Total = Sum(45)m = 1487.2728 (45)
Distribution loss (46)m = 0.15 x (45)m												
23.1298	20.2294	20.8750	18.1993	17.4627	15.0689	13.9636	16.0234	16.2148	18.8968	20.6273	22.3999	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	27.5592	24.8900	27.5310	26.6133	27.4788	26.5675	27.4376	27.4643	26.5924	27.5094	26.6560	(61)
Total heat required for water heating calculated for each month												
181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(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												
181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(64)
Heat gains from water heating, kWh/month												
58.1608	51.0644	53.1556	46.9951	45.5786	40.0447	37.8120	42.3847	42.5909	48.7652	52.3879	56.5410	(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	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.4872	47.5068	38.6351	29.2493	21.8642	18.4587	19.9452	25.9256	34.7973	44.1831	51.5682	54.9737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7040	344.2394	335.3302	316.3636	292.4217	269.9196	254.8868	251.3514	260.2606	279.2272	303.1692	325.6712	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	(71)
Water heating gains (Table 5)	78.1731	75.9887	71.4457	65.2710	61.2616	55.6176	50.8226	56.9687	59.1540	65.5447	72.7610	75.9959	(72)
Total internal gains	578.9461	574.3169	551.9930	517.4658	482.1293	450.5778	432.2366	440.8275	460.7938	495.5369	534.0802	563.2228	(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													3.6700	11.2829	0.6300	0.7000	0.7700	12.6549 (75)
Southwest													8.0000	36.7938	0.6300	0.7000	0.7700	89.9574 (79)
Northwest													1.3200	11.2829	0.6300	0.7000	0.7700	4.5516 (81)
Solar gains	107.1640	188.2552	272.7600	363.4084	430.2732	437.3779	417.4274	365.9814	303.9061	212.1553	129.3986	91.0365 (83)						
Total gains	686.1101	762.5721	824.7529	880.8742	912.4025	887.9557	849.6640	806.8089	764.6999	707.6922	663.4788	654.2593 (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	51.1828	51.3372	51.4895	52.2168	52.3551	53.0090	53.0090	53.1319	52.7552	52.3551	52.0760	51.7873
alpha	4.4122	4.4225	4.4326	4.4811	4.4903	4.5339	4.5339	4.5421	4.5170	4.4903	4.4717	4.4525
util living area	0.9852	0.9751	0.9534	0.8991	0.7899	0.6173	0.4615	0.5033	0.7309	0.9165	0.9740	0.9878 (86)
MIT	19.8328	20.0002	20.2568	20.5768	20.8247	20.9574	20.9908	20.9865	20.9079	20.5972	20.1637	19.8025 (87)
Th 2	19.9895	19.9923	19.9949	20.0075	20.0099	20.0209	20.0209	20.0229	20.0167	20.0099	20.0051	20.0001 (88)
util rest of house	0.9814	0.9688	0.9414	0.8729	0.7383	0.5361	0.3628	0.4023	0.6550	0.8891	0.9663	0.9846 (89)
MIT 2	18.9430	19.1096	19.3616	19.6741	19.8922	20.0003	20.0182	20.0186	19.9661	19.7011	19.2827	18.9216 (90)
Living area fraction	19.1338	19.3005	19.5535	19.8676	20.0921	20.2055	20.2267	20.2261	20.1680	19.8932	19.4715	19.1104 (91)
MIT	19.1338	19.3005	19.5535	19.8676	20.0921	20.2055	20.2267	20.2261	20.1680	19.8932	19.4715	19.1104 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1338	19.3005	19.5535	19.8676	20.0921	20.2055	20.2267	20.2261	20.1680	19.8932	19.4715	19.1104 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9772	0.9634	0.9350	0.8687	0.7429	0.5521	0.3839	0.4239	0.6676	0.8853	0.9611	0.9809	(94)
Useful gains	670.4891	734.6905	771.1289	765.2015	677.8595	490.2741	326.2209	341.9723	510.5161	626.5474	637.6606	641.7874	(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	1393.5306	1348.7627	1218.9855	1009.9287	770.7232	508.4518	328.9647	346.2502	553.0537	853.4830	1142.2861	1384.3813	(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	537.9429	412.6565	333.2053	176.2036	69.0906	0.0000	0.0000	0.0000	0.0000	168.8401	363.3304	552.4899	(98)
Space heating												2613.7592	(98)
Space heating per m2												30.9907	(99)
												(98) / (4) =	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2881.7632 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	537.9429	412.6565	333.2053	176.2036	69.0906	0.0000	0.0000	0.0000	0.0000	168.8401	363.3304	552.4899	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	593.1014	454.9686	367.3707	194.2708	76.1749	0.0000	0.0000	0.0000	0.0000	186.1522	400.5848	609.1399	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(64)
Efficiency of water heater (217)m	89.9762	89.9008	89.7467	89.4003	88.7892	87.9000	87.9000	87.9000	87.9000	89.3448	89.8096	90.0047	(216)
Fuel for water heating, kWh/month	202.0064	177.6991	185.7422	165.4827	162.0654	144.5132	137.1197	152.7727	153.2322	171.7929	182.7994	196.5276	(219)
Water heating fuel used												2031.7534	(219)
Annual totals kWh/year													
Space heating fuel - main system												2881.7632	(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)												377.8399	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1029 * 1.00) =										-535.1771		-535.1771	(233)
Total delivered energy for all uses												4831.1795	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2881.7632	3.4800	100.2854 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2031.7534	3.4800	70.7050 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	377.8399	13.1900	49.8371 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-535.1771	13.1900	-70.5899 (252)
Total energy cost			280.1301 (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] =	0.9097 (257)
SAP value		87.3103
SAP rating (Section 12)		87 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2881.7632	0.2160	622.4609 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2031.7534	0.2160	438.8587 (264)
Space and water heating			1061.3196 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	377.8399	0.5190	196.0989 (268)
Energy saving/generation technologies			
PV Unit	-535.1771	0.5190	-277.7569 (269)
Total kg/year			1018.5866 (272)
CO2 emissions per m2			12.0800 (273)
EI value			89.4471
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8905 = 3.908$, stars = 4
Water heating environmental impact	$0.216 / 0.8905 = 0.2426$, 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	42.1700 (1b)	x 2.3900 (2b)	= 100.7863 (1b) - (3b)
First floor	42.1700 (1c)	x 2.6700 (2c)	= 112.5939 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.3802 (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) = 0.1875 (8)
Pressure test					Yes
Measured/design AP50					4.6400
Infiltration rate					0.4195 (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)	=	0.3565 (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	0.3744	0.3476	0.3565	0.3387	0.3387	0.3298	0.3209	0.3120	0.3031	0.3298	0.3120	0.3298 (22b)
Effective ac	0.5701	0.5604	0.5636	0.5574	0.5574	0.5544	0.5515	0.5487	0.5459	0.5544	0.5487	0.5544 (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)			12.9900	1.1450	14.8740		(27)
Ground Floor			42.1700	0.1100	4.6387	140.0000	5903.8000 (28a)
Brick and Block	75.8400	12.9100	62.9300	0.2400	15.1032	42.2200	2656.9046 (29a)
External Cladding	18.7300	2.2000	16.5300	0.2400	3.9672	42.2200	697.8966 (29a)
Pitched Roof	42.1700		42.1700	0.1000	4.2170	9.0000	379.5300 (30)
Total net area of external elements Aum(A, m ²)			178.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.1321		(33)
Party Wall 1			42.7700	0.0000	0.0000	110.0000	4704.7000 (32)
Ground Floor Stud			69.4000			9.0000	624.6000 (32c)
First Floor Stud			91.5800			9.0000	824.2200 (32c)
Internal Floor 1			42.1700			18.0000	759.0600 (32d)
Internal Ceiling 1			42.1700			18.0000	759.0600 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17309.7712 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.2380 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3275 (36)
Total fabric heat loss							(33) + (36) = 51.4596 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.1421	39.4624	39.6834	39.2470	39.2470	39.0372	38.8330	38.6344	38.4414	39.0372	38.6344	39.0372 (38)
Heat transfer coeff	91.6017	90.9220	91.1430	90.7066	90.7066	90.4968	90.2926	90.0940	89.9010	90.4968	90.0940	90.4968 (39)
Average = Sum(39)m / 12 =												90.5793 (39)
HLP	1.0861	1.0780	1.0807	1.0755	1.0755	1.0730	1.0706	1.0682	1.0659	1.0730	1.0682	1.0730 (40)
HLP (average)												1.0740 (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												2.5401 (42)
Average daily hot water use (litres/day)												94.5267 (43)
Daily hot water use	103.9794	100.1983	96.4172	92.6361	88.8551	85.0740	85.0740	88.8551	92.6361	96.4172	100.1983	103.9794 (44)
Energy conte	154.1984	134.8629	139.1664	121.3287	116.4177	100.4596	93.0906	106.8229	108.0987	125.9786	137.5155	149.3329 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy content (annual)												Total = Sum (45)m = 1487.2728 (45)
Distribution loss (46)m = 0.15 x (45)m												
23.1298	20.2294	20.8750	18.1993	17.4627	15.0689	13.9636	16.0234	16.2148	18.8968	20.6273	22.3999	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	27.5592	24.8900	27.5310	26.6133	27.4788	26.5675	27.4376	27.4643	26.5924	27.5094	26.6560	(61)
Total heat required for water heating calculated for each month												
181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(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												
181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(64)
Heat gains from water heating, kWh/month												
58.1608	51.0644	53.1556	46.9951	45.5786	40.0447	37.8120	42.3847	42.5909	48.7652	52.3879	56.5410	(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	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.4872	47.5068	38.6351	29.2493	21.8642	18.4587	19.9452	25.9256	34.7973	44.1831	51.5682	54.9737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7040	344.2394	335.3302	316.3636	292.4217	269.9196	254.8868	251.3514	260.2606	279.2272	303.1692	325.6712	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	(71)
Water heating gains (Table 5)	78.1731	75.9887	71.4457	65.2710	61.2616	55.6176	50.8226	56.9687	59.1540	65.5447	72.7610	75.9959	(72)
Total internal gains	578.9461	574.3169	551.9930	517.4658	482.1293	450.5778	432.2366	440.8275	460.7938	495.5369	534.0802	563.2228	(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				3.6700	14.6176	0.6300	0.7000	0.7700	16.3952 (75)				
Southwest				8.0000	45.1778	0.6300	0.7000	0.7700	110.4554 (79)				
Northwest				1.3200	14.6176	0.6300	0.7000	0.7700	5.8969 (81)				
Solar gains	132.7475	198.9556	292.1459	394.3758	445.8917	493.1673	466.6684	417.7999	344.7523	242.3264	159.8622	110.8011	(83)
Total gains	711.6936	773.2725	844.1388	911.8416	928.0210	943.7452	898.9050	858.6274	805.5461	737.8633	693.9424	674.0239	(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	52.4910	52.8835	52.7552	53.0090	53.0090	53.1319	53.2521	53.3695	53.4841	53.1319	53.3695	53.1319
alpha	4.4994	4.5256	4.5170	4.5339	4.5339	4.5421	4.5501	4.5580	4.5656	4.5421	4.5580	4.5421
util living area	0.9801	0.9704	0.9417	0.8697	0.7362	0.5301	0.3884	0.4051	0.6544	0.8795	0.9614	0.9832 (86)
MIT	19.9780	20.1081	20.3666	20.6704	20.8843	20.9794	20.9960	20.9953	20.9482	20.7101	20.3227	19.9645 (87)
Th 2	20.0122	20.0188	20.0167	20.0209	20.0209	20.0229	20.0249	20.0269	20.0287	20.0229	20.0269	20.0229 (88)
util rest of house	0.9750	0.9629	0.9268	0.8374	0.6761	0.4460	0.2930	0.3061	0.5709	0.8417	0.9499	0.9787 (89)
MIT 2	19.1043	19.2368	19.4847	19.7696	19.9487	20.0144	20.0240	20.0258	20.0034	19.8129	19.4548	19.1001 (90)
Living area fraction	19.2916	19.4236	19.6738	19.9627	20.1493	20.2213	20.2324	20.2336	20.2060	20.0052	19.6408	19.2854 (92)
MIT	19.2916	19.4236	19.6738	19.9627	20.1493	20.2213	20.2324	20.2336	20.2060	20.0052	19.6408	19.2854 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2916	19.4236	19.6738	19.9627	20.1493	20.2213	20.2324	20.2336	20.2060	20.0052	19.6408	19.2854 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9703	0.9573	0.9207	0.8353	0.6846	0.4636	0.3135	0.3274	0.5870	0.8409	0.9443	0.9745	(94)
Useful gains	690.5347	740.2884	777.1579	761.6415	635.2896	437.4734	281.8223	281.1252	472.8644	620.4961	655.2827	656.8113	(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	1318.2975	1284.1451	1155.1271	949.0328	693.8430	445.3593	282.8295	282.3183	494.9928	778.7473	1057.7777	1292.7814	(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	467.0555	365.4717	281.2091	134.9217	43.5637	0.0000	0.0000	0.0000	0.0000	117.7389	289.7964	473.1617	(98)
Space heating												2172.9189	(98)
Space heating per m2											(98) / (4) =	25.7638	(99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2395.7209	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	467.0555	365.4717	281.2091	134.9217	43.5637	0.0000	0.0000	0.0000	0.0000	117.7389	289.7964	473.1617	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	514.9455	402.9457	310.0431	148.7560	48.0306	0.0000	0.0000	0.0000	0.0000	129.8114	319.5109	521.6778	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841	(64)	
Efficiency of water heater (217)m	89.8978	89.8297	89.6373	89.2137	88.5352	87.9000	87.9000	87.9000	87.9000	89.0940	89.6671	89.9206	(216)	
Fuel for water heating, kWh/month	202.1825	177.8398	185.9688	165.8288	162.5304	144.5132	137.1197	152.7727	153.2322	172.2766	183.0900	196.7114	(219)	
Water heating fuel used												2034.0661	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2395.7209	(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)													377.8399	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.65 * 1156 * 1.00) =										-601.2400			-601.2400	(233)
Total delivered energy for all uses													4281.3870	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2395.7209	10.2300	245.0823	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2034.0661	10.2300	208.0850	(247)
Pumps and fans for heating	75.0000	36.7200	27.5400	(249)
Energy for lighting	377.8399	36.7200	138.7428	(250)
Additional standing charges			103.0000	(251)
Energy saving/generation technologies				
PV Unit	-601.2400	36.7200	-220.7753	(252)
Total energy cost			501.6747	(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	2395.7209	0.2160	517.4757	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2034.0661	0.2160	439.3583	(264)
Space and water heating			956.8340	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	377.8399	0.5190	196.0989	(268)
Energy saving/generation technologies				
PV Unit	-601.2400	0.5190	-312.0435	(269)
Total kg/year			879.8144	(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	2395.7209	1.2200	2922.7795	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2034.0661	1.2200	2481.5606	(264)
Space and water heating			5404.3401	(265)
Pumps and fans	75.0000	3.0700	230.2500	(267)
Energy for lighting	377.8399	3.0700	1159.9685	(268)
Energy saving/generation technologies				
PV Unit	-601.2400	3.0700	-1845.8067	(269)
Primary energy kWh/year			4948.7520	(272)
Primary energy kWh/m2/year			58.6762	(273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):			
A			Not considered
B			Not considered
C			Not considered
D			Not considered
E	Low energy lighting		Already installed
F			Not considered
G			Not considered
H			Not considered
I			Not considered
J			Not considered
K			Not considered
M			Not considered
N	Solar water heating		Recommended
O			Not considered
P			Not considered
R			Not considered
S			Not considered
T			Not considered
U	Solar photovoltaic panels		Already installed
A2			Not considered
A3			Not considered
T2			Not considered
W			Not considered
X			Not considered
Y			Not considered
J2			Not considered
Q2			Not considered
Z1			Not considered
Z2			Not considered
Z3			Not considered
Z4			Not considered
Z5			Not considered
V2	Wind turbine		Not applicable
L2			Not considered
Q3			Not considered
O3			Not considered
Recommended measures:			
N	Solar water heating	SAP change + 1.2	Cost change -£ 84
			CO2 change -190 kg (21.6%)

		Typical annual savings	Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£84	2.25 kg/m²	B 89	B 91
Total Savings	£84	2.25 kg/m²		
Potential energy efficiency rating:			B 89	
Potential environmental impact rating:				B 91

Fuel prices for cost data on this page from database revision number 533 TEST (30 Nov 2023)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£166	£185	-£18
Mains gas	£556	£454	£102
Space heating	£376	£376	£0
Water heating	£208	£124	£84
Lighting	£139	£139	£0
Generated (PV)	-£221	-£221	£0
Total cost of fuels	£501	£418	£84
Total cost of uses	£502	£418	£84
Delivered energy	51 kWh/m²	39 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	8 kg/m²	2 kg/m²
Primary energy	59 kWh/m²	46 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1700 (1b)	x 2.3900 (2b)	= 100.7863 (1b) - (3b)
First floor	42.1700 (1c)	x 2.6700 (2c)	= 112.5939 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.3802 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1875 (8)
Pressure test					Yes
Measured/design AP50					4.6400
Infiltration rate					0.4195 (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) =	0.3565 (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	0.4546	0.4457	0.4368	0.3922	0.3833	0.3387	0.3387	0.3298	0.3565	0.3833	0.4011	0.4189 (22b)
Effective ac	0.6033	0.5993	0.5954	0.5769	0.5735	0.5574	0.5574	0.5544	0.5636	0.5735	0.5804	0.5878 (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)			12.9900	1.1450	14.8740		(27)
Ground Floor			42.1700	0.1100	4.6387	140.0000	5903.8000 (28a)
Brick and Block	75.8400	12.9100	62.9300	0.2400	15.1032	42.2200	2656.9046 (29a)
External Cladding	18.7300	2.2000	16.5300	0.2400	3.9672	42.2200	697.8966 (29a)
Pitched Roof	42.1700		42.1700	0.1000	4.2170	9.0000	379.5300 (30)
Total net area of external elements Aum(A, m ²)			178.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.1321		(33)
Party Wall 1			42.7700	0.0000	0.0000	110.0000	4704.7000 (32)
Ground Floor Stud			69.4000			9.0000	624.6000 (32c)
First Floor Stud			91.5800			9.0000	824.2200 (32c)
Internal Floor 1			42.1700			18.0000	759.0600 (32d)
Internal Ceiling 1			42.1700			18.0000	759.0600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 17309.7712 (34)
205.2380 (35)
6.3275 (36)
(33) + (36) = 51.4596 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.4834	42.2009	41.9240	40.6233	40.3799	39.2470	39.2470	39.0372	39.6834	40.3799	40.8722	41.3869 (38)
Heat transfer coeff	93.9430	93.6605	93.3836	92.0828	91.8395	90.7066	90.7066	90.4968	91.1430	91.8395	92.3318	92.8465 (39)
Average = Sum(39)m / 12 =												92.0817 (39)
HLP	1.1139	1.1105	1.1072	1.0918	1.0889	1.0755	1.0755	1.0730	1.0807	1.0889	1.0948	1.1009 (40)
HLP (average)												1.0918 (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												2.5401 (42)
Average daily hot water use (litres/day)												94.5267 (43)
Daily hot water use	103.9794	100.1983	96.4172	92.6361	88.8551	85.0740	85.0740	88.8551	92.6361	96.4172	100.1983	103.9794 (44)
Energy conte	154.1984	134.8629	139.1664	121.3287	116.4177	100.4596	93.0906	106.8229	108.0987	125.9786	137.5155	149.3329 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)												Total = Sum (45)m = 1487.2728 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.1298	20.2294	20.8750	18.1993	17.4627	15.0689	13.9636	16.0234	16.2148	18.8968	20.6273	22.3999 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5592	24.8900	27.5310	26.6133	27.4788	26.5675	27.4376	27.4643	26.5924	27.5094	26.6560	27.5512 (61)
Total heat required for water heating calculated for each month												
	181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841 (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												1.2194 (H8)
Utilisation factor												0.5596 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.5267 (H14)
Volume ratio Veff/V												0.7934 (H15)
Solar storage volume factor												0.9537 (H16)
Solar input												-851.0847 (H17)
Solar input	-24.6798	-41.1834	-70.1401	-94.0015	-116.1310	-114.1753	-112.6664	-98.4372	-77.0961	-52.6475	-29.2738	-20.6527 (63)
												Solar input (sum of months) = Sum (63)m = -851.0847 (63)
Output from w/h												
	157.0779	118.5694	96.5574	53.9404	27.7655	12.8519	7.8618	35.8500	57.5950	100.8405	134.8977	156.2313 (64)
												Total per year (kWh/year) = Sum (64)m = 960.0388 (64)
Heat gains from water heating, kWh/month												
	58.1608	51.0644	53.1556	46.9951	45.5786	40.0447	37.8120	42.3847	42.5909	48.7652	52.3879	56.5410 (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	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.4872	47.5068	38.6351	29.2493	21.8642	18.4587	19.9452	25.9256	34.7973	44.1831	51.5682	54.9737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7040	344.2394	335.3302	316.3636	292.4217	269.9196	254.8868	251.3514	260.2606	279.2272	303.1692	325.6712	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	(71)
Water heating gains (Table 5)	78.1731	75.9887	71.4457	65.2710	61.2616	55.6176	50.8226	56.9687	59.1540	65.5447	72.7610	75.9959	(72)
Total internal gains	578.9461	574.3169	551.9930	517.4658	482.1293	450.5778	432.2366	440.8275	460.7938	495.5369	534.0802	563.2228	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W			
Northeast				3.6700	11.2829		0.6300		0.7000		0.7700		12.6549		(75)	
Southwest				8.0000	36.7938		0.6300		0.7000		0.7700		89.9574		(79)	
Northwest				1.3200	11.2829		0.6300		0.7000		0.7700		4.5516		(81)	
Solar gains				107.1640	188.2552	272.7600	363.4084	430.2732	437.3779	417.4274	365.9814	303.9061	212.1553	129.3986	91.0365	(83)
Total gains				686.1101	762.5721	824.7529	880.8742	912.4025	887.9557	849.6640	806.8089	764.6999	707.6922	663.4788	654.2593	(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	51.1828	51.3372	51.4895	52.2168	52.3551	53.0090	53.0090	53.1319	52.7552	52.3551	52.0760	51.7873
alpha	4.4122	4.4225	4.4326	4.4811	4.4903	4.5339	4.5339	4.5421	4.5170	4.4903	4.4717	4.4525
util living area	0.9852	0.9751	0.9534	0.8991	0.7899	0.6173	0.4615	0.5033	0.7309	0.9165	0.9740	0.9878 (86)
MIT	19.8328	20.0002	20.2568	20.5768	20.8247	20.9574	20.9908	20.9865	20.9079	20.5972	20.1637	19.8025 (87)
Th 2	19.9895	19.9923	19.9949	20.0075	20.0099	20.0209	20.0209	20.0229	20.0167	20.0099	20.0051	20.0001 (88)
util rest of house	0.9814	0.9688	0.9414	0.8729	0.7383	0.5361	0.3628	0.4023	0.6550	0.8891	0.9663	0.9846 (89)
MIT 2	18.9430	19.1096	19.3616	19.6741	19.8922	20.0003	20.0182	20.0186	19.9661	19.7011	19.2827	18.9216 (90)
Living area fraction	fLA = Living area / (4) =											0.2144 (91)
MIT	19.1338	19.3005	19.5535	19.8676	20.0921	20.2055	20.2267	20.2261	20.1680	19.8932	19.4715	19.1104 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1338	19.3005	19.5535	19.8676	20.0921	20.2055	20.2267	20.2261	20.1680	19.8932	19.4715	19.1104 (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	0.9772	0.9634	0.9350	0.8687	0.7429	0.5521	0.3839	0.4239	0.6676	0.8853	0.9611	0.9809	(94)
Useful gains	670.4891	734.6905	771.1289	765.2015	677.8595	490.2741	326.2209	341.9723	510.5161	626.5474	637.6606	641.7874	(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	1393.5306	1348.7627	1218.9855	1009.9287	770.7232	508.4518	328.9647	346.2502	553.0537	853.4830	1142.2861	1384.3813	(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	537.9429	412.6565	333.2053	176.2036	69.0906	0.0000	0.0000	0.0000	0.0000	168.8401	363.3304	552.4899	(98)
Space heating												2613.7592	(98)
Space heating per m2												(98) / (4) =	30.9907 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2881.7632 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	537.9429	412.6565	333.2053	176.2036	69.0906	0.0000	0.0000	0.0000	0.0000	168.8401	363.3304	552.4899	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	593.1014	454.9686	367.3707	194.2708	76.1749	0.0000	0.0000	0.0000	0.0000	186.1522	400.5848	609.1399	(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	157.0779	118.5694	96.5574	53.9404	27.7655	12.8519	7.8618	35.8500	57.5950	100.8405	134.8977	156.2313	(64)
Efficiency of water heater	90.0517	90.0555	90.0279	89.8793	87.9000	87.9000	87.9000	87.9000	87.9000	89.6324	89.9244	90.0675	(216)
(217)m	174.4308	131.6565	107.2199	59.9152	30.8920	14.6210	8.9441	40.7850	65.5234	112.5045	150.0123	173.4602	(219)
Fuel for water heating, kWh/month												1069.9648	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													2881.7632 (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)													377.8399 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1029 * 1.00) =										-535.1771			-535.1771 (233)
Total delivered energy for all uses													3919.3908 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2881.7632	3.4800	100.2854 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1069.9648	3.4800	37.2348 (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	377.8399	13.1900	49.8371 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-535.1771	13.1900	-70.5899 (252)
Total energy cost			253.2549 (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] =	0.8224 (257)
SAP value		88.5278
SAP rating (Section 12)		89 (258)
SAP band		B

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2881.7632	0.2160	622.4609 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1069.9648	0.2160	231.1124 (264)
Space and water heating			853.5732 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	377.8399	0.5190	196.0989 (268)
Energy saving/generation technologies			
PV Unit	-535.1771	0.5190	-277.7569 (269)
Total kg/year			836.7902 (272)
CO2 emissions per m2			9.9200 (273)
EI value			91.3306
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	42.1700 (1b)	x 2.3900 (2b)	= 100.7863 (1b) - (3b)
First floor	42.1700 (1c)	x 2.6700 (2c)	= 112.5939 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.3802 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1875 (8)
Pressure test					Yes
Measured/design AP50					4.6400
Infiltration rate					0.4195 (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)	=	0.3565 (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	0.3744	0.3476	0.3565	0.3387	0.3387	0.3298	0.3209	0.3120	0.3031	0.3298	0.3120	0.3298 (22b)
Effective ac	0.5701	0.5604	0.5636	0.5574	0.5574	0.5544	0.5515	0.5487	0.5459	0.5544	0.5487	0.5544 (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)			12.9900	1.1450	14.8740		(27)
Ground Floor			42.1700	0.1100	4.6387	140.0000	5903.8000 (28a)
Brick and Block	75.8400	12.9100	62.9300	0.2400	15.1032	42.2200	2656.9046 (29a)
External Cladding	18.7300	2.2000	16.5300	0.2400	3.9672	42.2200	697.8966 (29a)
Pitched Roof	42.1700		42.1700	0.1000	4.2170	9.0000	379.5300 (30)
Total net area of external elements Aum(A, m ²)			178.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.1321		(33)
Party Wall 1			42.7700	0.0000	0.0000	110.0000	4704.7000 (32)
Ground Floor Stud			69.4000			9.0000	624.6000 (32c)
First Floor Stud			91.5800			9.0000	824.2200 (32c)
Internal Floor 1			42.1700			18.0000	759.0600 (32d)
Internal Ceiling 1			42.1700			18.0000	759.0600 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17309.7712 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.2380 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3275 (36)
Total fabric heat loss							(33) + (36) = 51.4596 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.1421	39.4624	39.6834	39.2470	39.2470	39.0372	38.8330	38.6344	38.4414	39.0372	38.6344	39.0372 (38)
Heat transfer coeff	91.6017	90.9220	91.1430	90.7066	90.7066	90.4968	90.2926	90.0940	89.9010	90.4968	90.0940	90.4968 (39)
Average = Sum(39)m / 12 =												90.5793 (39)
HLP	1.0861	1.0780	1.0807	1.0755	1.0755	1.0730	1.0706	1.0682	1.0659	1.0730	1.0682	1.0730 (40)
HLP (average)												1.0740 (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												2.5401 (42)
Average daily hot water use (litres/day)												94.5267 (43)
Daily hot water use	103.9794	100.1983	96.4172	92.6361	88.8551	85.0740	85.0740	88.8551	92.6361	96.4172	100.1983	103.9794 (44)
Energy conte	154.1984	134.8629	139.1664	121.3287	116.4177	100.4596	93.0906	106.8229	108.0987	125.9786	137.5155	149.3329 (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

Energy content (annual)	Total = Sum (45)m = 1487.2728 (45)										
Distribution loss (46)m = 0.15 x (45)m											
23.1298	20.2294	20.8750	18.1993	17.4627	15.0689	13.9636	16.0234	16.2148	18.8968	20.6273	22.3999 (46)
Water storage loss:											
Total storage loss											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5592	24.8900	27.5310	26.6133	27.4788	26.5675	27.4376	27.4643	26.5924	27.5094	26.6560 (61)
Total heat required for water heating calculated for each month											
181.7576	159.7529	166.6975	147.9419	143.8965	127.0271	120.5282	134.2872	134.6911	153.4880	164.1714	176.8841 (62)
Aperture area of solar collector											
Zero-loss collector efficiency											
Collector heat loss coefficient											
Collector 2nd order heat loss coefficient											
Collector effective heat loss coefficient											
Collector performance ratio											
Annual solar radiation per m2											
Overshading factor											
Solar energy available											
Adjustment factor for showers											
Solar-to-load ratio											
Utilisation factor											
Collector performance factor											
Dedicated solar storage volume											
Effective solar volume											
Daily hot water demand											
Volume ratio Veff/V											
Solar storage volume factor											
Solar input											
Solar input	-28.8416	-41.0109	-70.4878	-95.1044	-111.7059	-119.3195	-116.8102	-104.5487	-81.8544	-56.5913	-34.1120
Solar input (sum of months) = Sum (63)m =											
-884.1027											
Output from w/h											
152.9161	118.7420	96.2096	52.8375	32.1907	7.7077	3.7180	29.7385	52.8367	96.8967	130.0595	153.1679 (64)
Total per year (kWh/year) = Sum (64)m =											
927.0208											
Heat gains from water heating, kWh/month											
58.1608	51.0644	53.1556	46.9951	45.5786	40.0447	37.8120	42.3847	42.5909	48.7652	52.3879	56.5410 (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	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	152.4042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.4872	47.5068	38.6351	29.2493	21.8642	18.4587	19.9452	25.9256	34.7973	44.1831	51.5682	54.9737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7040	344.2394	335.3302	316.3636	292.4217	269.9196	254.8868	251.3514	260.2606	279.2272	303.1692	325.6712	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	52.7805	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	-101.6028	(71)
Water heating gains (Table 5)	78.1731	75.9887	71.4457	65.2710	61.2616	55.6176	50.8226	56.9687	59.1540	65.5447	72.7610	75.9959	(72)
Total internal gains	578.9461	574.3169	551.9930	517.4658	482.1293	450.5778	432.2366	440.8275	460.7938	495.5369	534.0802	563.2228	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d		Gains W	
Northeast				3.6700	14.6176	0.6300		0.7000	0.7700		16.3952 (75)	
Southwest				8.0000	45.1778	0.6300		0.7000	0.7700		110.4554 (79)	
Northwest				1.3200	14.6176	0.6300		0.7000	0.7700		5.8969 (81)	
Solar gains	132.7475	198.9556	292.1459	394.3758	445.8917	493.1673	466.6684	417.7999	344.7523	242.3264	159.8622	110.8011 (83)
Total gains	711.6936	773.2725	844.1388	911.8416	928.0210	943.7452	898.9050	858.6274	805.5461	737.8633	693.9424	674.0239 (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	52.4910	52.8835	52.7552	53.0090	53.0090	53.1319	53.2521	53.3695	53.4841	53.1319	53.3695	53.1319
alpha	4.4994	4.5256	4.5170	4.5339	4.5339	4.5421	4.5501	4.5580	4.5656	4.5421	4.5580	4.5421
util living area	0.9801	0.9704	0.9417	0.8697	0.7362	0.5301	0.3884	0.4051	0.6544	0.8795	0.9614	0.9832 (86)
MIT	19.9780	20.1081	20.3666	20.6704	20.8843	20.9794	20.9960	20.9953	20.9482	20.7101	20.3227	19.9645 (87)
Th 2	20.0122	20.0188	20.0167	20.0209	20.0209	20.0229	20.0249	20.0269	20.0287	20.0229	20.0269	20.0229 (88)
util rest of house	0.9750	0.9629	0.9268	0.8374	0.6761	0.4460	0.2930	0.3061	0.5709	0.8417	0.9499	0.9787 (89)
MIT 2	19.1043	19.2368	19.4847	19.7696	19.9487	20.0144	20.0240	20.0258	20.0034	19.8129	19.4548	19.1001 (90)
Living area fraction									fLA = Living area / (4) =			0.2144 (91)
MIT	19.2916	19.4236	19.6738	19.9627	20.1493	20.2213	20.2324	20.2336	20.2060	20.0052	19.6408	19.2854 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2916	19.4236	19.6738	19.9627	20.1493	20.2213	20.2324	20.2336	20.2060	20.0052	19.6408	19.2854 (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	0.9703	0.9573	0.9207	0.8353	0.6846	0.4636	0.3135	0.3274	0.5870	0.8409	0.9443	0.9745	(94)
Useful gains	690.5347	740.2884	777.1579	761.6415	635.2896	437.4734	281.8223	281.1252	472.8644	620.4961	655.2827	656.8113	(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	1318.2975	1284.1451	1155.1271	949.0328	693.8430	445.3593	282.8295	282.3183	494.9928	778.7473	1057.7777	1292.7814	(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	467.0555	365.4717	281.2091	134.9217	43.5637	0.0000	0.0000	0.0000	0.0000	117.7389	289.7964	473.1617	(98)
Space heating												2172.9189	(98)
Space heating per m2												(98) / (4) =	25.7638 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2395.7209 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	467.0555	365.4717	281.2091	134.9217	43.5637	0.0000	0.0000	0.0000	0.0000	117.7389	289.7964	473.1617	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	514.9455	402.9457	310.0431	148.7560	48.0306	0.0000	0.0000	0.0000	0.0000	129.8114	319.5109	521.6778	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	152.9161	118.7420	96.2096	52.8375	32.1907	7.7077	3.7180	29.7385	52.8367	96.8967	130.0595	153.1679	(64)
Efficiency of water heater	89.9929	89.9970	89.9694	89.8942	89.4887	87.9000	87.9000	87.9000	87.9000	89.4142	89.8138	89.9989	(216)
(217)m	89.9929	89.9970	89.9694	89.8942	89.4887	87.9000	87.9000	87.9000	87.9000	89.4142	89.8138	89.9989	(217)
Fuel for water heating, kWh/month	169.9201	131.9400	106.9359	58.7775	35.9718	8.7687	4.2298	33.8322	60.1100	108.3684	144.8102	170.1886	(219)
Water heating fuel used												1033.8531	(219)
Annual totals kWh/year													
Space heating fuel - main system												2395.7209	(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)													377.8399 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.65 * 1156 * 1.00) =									-601.2400			-601.2400	(233)
Total delivered energy for all uses												3331.1740	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2395.7209	10.2300	245.0823	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1033.8531	10.2300	105.7632	(247)
Pumps and fans for heating	75.0000	36.7200	27.5400	(249)
Pump for solar water heating	50.0000	36.7200	18.3600	(249)
Energy for lighting	377.8399	36.7200	138.7428	(250)
Additional standing charges			103.0000	(251)
Energy saving/generation technologies				
PV Unit	-601.2400	36.7200	-220.7753	(252)
Total energy cost			417.7129	(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	2395.7209	0.2160	517.4757	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1033.8531	0.2160	223.3123	(264)
Space and water heating			740.7880	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	377.8399	0.5190	196.0989	(268)
Energy saving/generation technologies				
PV Unit	-601.2400	0.5190	-312.0435	(269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Total kg/year

689.7184 (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	2395.7209	1.2200	2922.7795 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1033.8531	1.2200	1261.3008 (264)
Space and water heating			4184.0803 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	377.8399	3.0700	1159.9685 (268)
Energy saving/generation technologies			
PV Unit	-601.2400	3.0700	-1845.8067 (269)
Primary energy kWh/year			3881.9922 (272)
Primary energy kWh/m2/year			46.0279 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 48	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Project	5, Nuthatch Way, Botley, SO32 2UH		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.01	TER	18.09
Environmental	89 B	% DER<TER	22.54		
CO ₂ Emissions (t/year)	0.88	DFEE	41.56	TFEE	51.38
General Requirements Compliance	Pass	% DFEE<TFEE	19.11		

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 48	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Project	5, Nuthatch Way, Botley, SO32 2UH		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.01	TER	18.09
Environmental	89 B	% DER<TER	22.54		
CO ₂ Emissions (t/year)	0.88	DFEE	41.56	TFEE	51.38
General Requirements Compliance	Pass	% DFEE<TFEE	19.11		

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 000005

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 48	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Project	5, Nuthatch Way, Botley, SO32 2UH		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.01	TER	18.09
Environmental	89 B	% DER<TER	22.54		
CO ₂ Emissions (t/year)	0.88	DFEE	41.56	TFEE	51.38
General Requirements Compliance	Pass	% DFEE<TFEE	19.11		

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 000008

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				0.1300			
Layer 1	Tiling, clay						
	Main construction	30	1.0000	0.0000	100.00		
Layer 2	Standard cavity						
	Main construction	25	0.0000	0.0000	90.50		
	Main construction	25	0.1300	0.0000	9.50		
	Corrections - Cavity Ventilated, Emissivity: Normal						
Layer 3	Blockwork, dense						
	Main construction	100	1.5900	0.0629	93.18		
	Main construction	100	0.8800	0.1136	6.82		
Layer 4	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
Layer 5	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 6	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 7	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.349 m ² K/W	Lower limit = 4.137 m ² K/W	Average = 4.243 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: 383 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 48	Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L
Project	5, Nuthatch Way, Botley, SO32 2UH		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.01	TER	18.09
Environmental	89 B	% DER<TER	22.54		
CO ₂ Emissions (t/year)	0.88	DFEE	41.56	TFEE	51.38
General Requirements Compliance	Pass	% DFEE<TFEE	19.11		

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

Building Elements

Floor 000007 - Floor - suspended beam-and-block floor

Floor Type: Suspended Floor

Area = 42.17 m², Perimeter = 18.65 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 m² K/W Lower limit = 5.066 m² K/W Average = 7.579 m² K/W
Total correction = 0.0025 m² K/W U-value (unrounded) = 0.11 W/m² 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 48			Issued on Date	03/01/2024
Assessment Reference	As Built	Prop Type Ref	Block L		
Property	5, Nuthatch Way, Botley, SO32 2UH				
SAP Rating	87 B	DER	14.01	TER	18.09
Environmental	89 B	% DER<TER	22.54		
CO ₂ Emissions (t/year)	0.88	DFEE	41.56	TFEE	51.38
General Requirements Compliance	Pass	% DFEE<TFEE	19.11		
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 East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, End-Terrace
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:	18.69 m	42.17 m ²	2.39 m
	1st Storey:	18.69 m	42.17 m ²	2.67 m

7.0 Living Area	18.08	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	205.24	kJ/m ² K

9.0 External Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
Brick and Block	Cavity Wall	Other		0.24	42.22	75.84	62.93
External Cladding	Cavity Wall	Other		0.24	42.22	18.73	16.53

9.1 Party Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction				
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill		0.00	110.00	42.77

9.2 Internal Walls				Kappa (kJ/m ² K)	Area (m ²)
Description	Construction				
Ground Floor Stud	Plasterboard on timber frame			9.00	69.40
First Floor Stud	Plasterboard on timber frame			9.00	91.58

10.0 External Roofs				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
Pitched Roof	External Plane Roof	Plasterboard, insulated at ceiling level		0.10	9.00	42.17	42.17

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.17

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	42.17

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.17

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 East							2.12	
Front Elevation	Window	[1] Brick and Block	North East	None	0.00					1.47	
Front Elevation	Window	[2] External Cladding	North East	None	0.00					2.20	
Side Elevation	Window	[1] Brick and Block	North West	None	0.00					1.32	
Rear Elevation	Window	[1] Brick and Block	South West	None	0.00					8.00	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.49	0.093	No	Birtley Supatherm
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)	3.76	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.91	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.77	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	8.66	0.021	No	Knauf P5
Independently assessed	E4 Jamb	28.50	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	18.69	0.062	No	BE-E5-23902
Independently assessed	E6 Intermediate floor within a dwelling	18.69	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	13.85	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	4.84	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	15.15	0.039	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	5.05	0.036	No	Knauf P25 Halved
Independently assessed	E25 Staggered party wall between dwellings	5.05	0.055	No	Knauf P27 Halved
Table K1 - Default	P1 Party wall - Ground floor	8.47	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.47	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.47	0.035	No	Knauf P29 Halved

Y-value	0.035	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	5.00
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SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Tested ?	Yes	m ³ /(h.m ²) @ 50 Pa
As Built AP ₅₀	4.64	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	No
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20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	19	
Total number of L.E.L. fittings	19	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Combi keep hot type	Gas/Oil, time clock			
25.0 Main Heating 2	None			
Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.65	South West	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	£84	B 89	