



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 6 Wheatear Road
BOTLEY, SO32 2TX

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 30/01/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 9	Issued on Date	30/01/2024
Assessment Reference	As Built	Prop Type Ref	Block A
Property	6 Wheatear Road, BOTLEY, SO32 2TX		
SAP Rating	91 B	DER	10.22
Environmental	92 A	TER	16.68
CO ₂ Emissions (t/year)	0.64	% DER<TER	38.73
General Requirements Compliance	Pass	DfEE	39.30
		TfEE	49.19
		% DfEE<TfEE	20.11
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)	16.68	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.22	kgCO ₂ /m ²	Pass
	-6.46 (-38.7%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	49.19	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	39.30	kWh/m ² /yr	
	-9.9 (-20.1%)	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	4.72 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 4000 GR4700iW 30 C NG
Combi boiler
Efficiency: 89.3% 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 East

7.49 m², No overhang

Windows facing South

9.16 m², No overhang

Windows facing West

4.12 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

4.72 (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	0.038	W/m ² K
Photovoltaic array	1.20	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 9	Issued on Date	30/01/2024
Assessment Reference	As Built	Prop Type Ref	Block A
Property	6 Wheatear Road, BOTLEY, SO32 2TX		

SAP Rating	91 B	DER	10.22	TER	16.68
Environmental	92 A	% DER<TER	38.73		
CO ₂ Emissions (t/year)	0.64	DFEE	39.30	TFEE	49.19
General Requirements Compliance	Pass	% DFEE<TFEE	20.11		

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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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	0.63	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	5.17	0.36	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.01	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	3.60	0.24	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	7.08	0.45	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	14.97	0.31	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	36.30	0.58	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.062	19.84	1.23	BE-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	19.84	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.89	0.53	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	11.09	0.49	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	Table K1 - Default	0.120	5.05	0.61	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.81	1.41	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.81	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.81	0.31	Knauf P29 Halved

Total: **7.42** W/mK:
Y-Value: **0.038** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	92 A	% DER<TER	38.73		
CO ₂ Emissions (t/year)	0.64	DFEE	39.30	TFEE	49.19
General Requirements Compliance	Pass	% DFEE<TFEE	20.11		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

FULL SAP CALCULATION PRINTOUT

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

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

DWELLING AS BUILT

End-Terrace House, total floor area 97 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) 16.68 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.22 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)39.3 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: 4.72 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 4000 GR4700iW 30 C NG
Combi boiler
Efficiency: 89.3% 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 East: 7.49 m², No overhang
Windows facing South: 9.16 m², No overhang
Windows facing West: 4.12 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 0.038 W/m²K
Photovoltaic array 1.20 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.3300 (1b)	x 2.3900 (2b)	= 115.5087 (1b) - (3b)
First floor	48.3300 (1c)	x 2.6700 (2c)	= 129.0411 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 244.5498 (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) = 0.1227 (8)
Pressure test					Yes
Measured/design AP50					4.7200
Infiltration rate					0.3587 (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) =				0.3049 (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	0.3887	0.3811	0.3735	0.3354	0.3277	0.2896	0.2896	0.2820	0.3049	0.3277	0.3430	0.3582 (22b)
Effective ac	0.5755	0.5726	0.5697	0.5562	0.5537	0.5419	0.5419	0.5398	0.5465	0.5537	0.5588	0.5642 (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)			20.7700	1.1450	23.7824		(27)
Ground Floor			48.3300	0.1100	5.3163	140.0000	6766.2000 (28a)
Brick and Block	100.3900	22.8900	77.5000	0.2400	18.6000	42.2200	3272.0500 (29a)
Pitched Roof	48.3300		48.3300	0.1000	4.8330	9.0000	434.9700 (30)
Total net area of external elements Aum(A, m ²)			197.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8637		(33)
Party Wall 1			44.1900	0.0000	0.0000	110.0000	4860.9000 (32)
Ground Floor Block			52.6600			75.0000	3949.5000 (32c)
Ground Floor Stud			36.6800			9.0000	330.1200 (32c)
First Floor Stud			116.5700			9.0000	1049.1300 (32c)
Internal Floor 1			48.3300			18.0000	869.9400 (32d)
Internal Ceiling 1			48.3300			18.0000	869.9400 (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) = 22402.7500 (34)
231.7686 (35)
7.4197 (36)
(33) + (36) = 62.2834 (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	46.4476	46.2109	45.9788	44.8888	44.6849	43.7355	43.7355	43.5597	44.1012	44.6849	45.0975	45.5288 (38)
Heat transfer coeff	108.7310	108.4943	108.2622	107.1722	106.9683	106.0189	106.0189	105.8431	106.3846	106.9683	107.3808	107.8122 (39)
Average = Sum(39)m / 12 =												107.1712 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1249	1.1224	1.1200	1.1088	1.1066	1.0968	1.0968	1.0950	1.1006	1.1066	1.1109	1.1154 (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												2.7064 (42)
Average daily hot water use (litres/day)												98.4765 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	108.3242	104.3851	100.4461	96.5070	92.5679	88.6289	88.6289	92.5679	96.5070	100.4461	104.3851	108.3242 (44)
	160.6416	140.4982	144.9816	126.3984	121.2823	104.6574	96.9805	111.2865	112.6156	131.2427	143.2616	155.5729 (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 =	1549.4194 (45)
Distribution loss (46)m = 0.15 x (45)m													
24.0962	21.0747	21.7472	18.9598	18.1923	15.6986	14.5471	16.6930	16.8923	19.6864	21.4892	23.3359 (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	28.4522	25.6969	28.4459	27.5210	28.4328	27.5093	28.4223	28.4291	27.5157	28.4404	27.5295	28.4502 (61)	
Total heat required for water heating calculated for each month													
189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230 (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													
189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230 (64)		
												Total per year (kWh/year) = Sum (64)m =	1884.2648 (64)
Heat gains from water heating, kWh/month													
60.5264	53.1399	55.3179	48.9077	47.4346	41.6759	39.3516	44.1101	44.3236	50.7483	54.5169	58.8405 (65)		

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.3900	19.8866	16.1728	12.2439	9.1524	7.7269	8.3492	10.8526	14.5663	18.4952	21.5867	23.0122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	250.8124	253.4150	246.8564	232.8940	215.2689	198.7038	187.6373	185.0346	191.5932	205.5556	223.1807	239.7458	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	(71)
Water heating gains (Table 5)	81.3527	79.0772	74.3520	67.9274	63.7562	57.8832	52.8919	59.2877	61.5606	68.2101	75.7179	79.0867	(72)
Total internal gains	421.1507	418.9745	403.9769	379.6609	354.7732	330.9096	315.4741	321.7706	334.3158	358.8567	387.0810	408.4405	(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
East				7.4900	19.6403		0.6300		0.7000		0.7700		44.9574 (76)
South				9.1600	46.7521		0.6300		0.7000		0.7700		130.8784 (78)
West				4.1200	19.6403		0.6300		0.7000		0.7700		24.7296 (80)
Solar gains	200.5654	350.6676	497.5413	636.0170	722.8436	720.2422	693.4429	629.5690	546.3271	392.9494	242.0270		170.3982 (83)
Total gains	621.7161	769.6421	901.5182	1015.6780	1077.6168	1051.1518	1008.9170	951.3396	880.6429	751.8061	629.1080		578.8387 (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	57.2328	57.3577	57.4807	58.0653	58.1760	58.6969	58.6969	58.7944	58.4952	58.1760	57.9525	57.7206	
alpha	4.8155	4.8238	4.8320	4.8710	4.8784	4.9131	4.9131	4.9196	4.8997	4.8784	4.8635	4.8480	
util living area	0.9962	0.9892	0.9696	0.9134	0.7951	0.6167	0.4567	0.5023	0.7472	0.9468	0.9913	0.9973	(86)
MIT	19.7604	19.9785	20.2785	20.6165	20.8565	20.9685	20.9940	20.9906	20.9208	20.5834	20.0972	19.7191	(87)
Th 2	19.9806	19.9826	19.9845	19.9937	19.9954	20.0034	20.0034	20.0049	20.0003	19.9954	19.9919	19.9883	(88)
util rest of house	0.9951	0.9859	0.9604	0.8879	0.7407	0.5321	0.3562	0.3984	0.6677	0.9253	0.9881	0.9965	(89)
MIT 2	18.8550	19.0729	19.3684	19.6952	19.9027	19.9893	20.0019	20.0022	19.9590	19.6737	19.1995	18.8202	(90)
Living area fraction	19.0022	19.2201	19.5163	19.8450	20.0577	20.1484	20.1631	20.1629	20.1153	19.8216	19.3454	18.9663	(92)
MIT	19.0022	19.2201	19.5163	19.8450	20.0577	20.1484	20.1631	20.1629	20.1153	19.8216	19.3454	18.9663	(93)
Temperature adjustment												0.0000	
adjusted MIT	19.0022	19.2201	19.5163	19.8450	20.0577	20.1484	20.1631	20.1629	20.1153	19.8216	19.3454	18.9663	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9935	0.9827	0.9551	0.8835	0.7444	0.5449	0.3725	0.4153	0.6777	0.9207	0.9853	0.9953	(94)
Useful gains	617.6756	756.3068	861.0096	897.3080	802.1247	572.7856	375.8600	395.0637	596.7821	692.2014	619.8896	576.1014	(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	1598.5839	1553.6455	1409.1781	1172.9956	894.0077	588.2377	377.7596	398.2757	639.9387	986.4172	1314.9257	1591.9825	(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	729.7958	535.8116	407.8373	198.4951	68.3610	0.0000	0.0000	0.0000	0.0000	218.8966	500.4260	755.8156	(98)
Space heating												3415.4390	(98)
Space heating per m2												35.3346	(99)
												(98) / (4) =	

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 %)													90.2000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													3786.5177	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	729.7958	535.8116	407.8373	198.4951	68.3610	0.0000	0.0000	0.0000	0.0000	218.8966	500.4260	755.8156	(98)	
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)	
Space heating fuel (main heating system)	809.0862	594.0262	452.1478	220.0611	75.7882	0.0000	0.0000	0.0000	0.0000	242.6792	554.7960	837.9330	(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	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230	(64)	
Efficiency of water heater (217)m	89.6524	89.5706	89.4082	89.0457	88.3988	87.6000	87.6000	87.6000	87.6000	89.0847	89.5239	89.6788	(216)	
Fuel for water heating, kWh/month	210.9188	185.5465	193.9726	172.8544	169.3634	150.8753	143.1539	159.4928	159.9672	179.2485	190.7771	205.2023	(219)	
Water heating fuel used												2121.3729	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3786.5177	(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)													395.4137	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 1.20 * 1068 * 1.00) =										-1025.3477			-1025.3477	(233)
Total delivered energy for all uses													5352.9567	(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	3786.5177	0.2160	817.8878	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2121.3729	0.2160	458.2166	(264)
Space and water heating			1276.1044	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	395.4137	0.5190	205.2197	(268)
Energy saving/generation technologies				
PV Unit	-1025.3477	0.5190	-532.1554	(269)
Total CO2, kg/year			988.0937	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.2200	(273)

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

DER		10.2200	ZC1
Total Floor Area		96.6600	TFA
Assumed number of occupants		2.7064	N
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	EF
CO2 emissions from appliances, equation (L14)		15.3762	ZC2
CO2 emissions from cooking, equation (L16)		1.9031	ZC3
Total CO2 emissions		27.4993	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		27.4993	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.3300 (1b)	x 2.3900 (2b)	= 115.5087 (1b) - (3b)
First floor	48.3300 (1c)	x 2.6700 (2c)	= 129.0411 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 244.5498 (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) = 0.1227 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3727 (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) =	0.3168 (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	0.4039	0.3960	0.3880	0.3485	0.3405	0.3009	0.3009	0.2930	0.3168	0.3405	0.3564	0.3722 (22b)
Effective ac	0.5816	0.5784	0.5753	0.5607	0.5580	0.5453	0.5453	0.5429	0.5502	0.5580	0.5635	0.5693 (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)			20.7700	1.3258	27.5360		(27)
Ground Floor			48.3300	0.1300	6.2829		(28a)
Brick and Block	100.3900	22.8900	77.5000	0.1800	13.9500		(29a)
Pitched Roof	48.3300		48.3300	0.1300	6.2829		(30)
Total net area of external elements Aum(A, m ²)			197.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.5958		(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)							11.5427 (36)
Total fabric heat loss						(33) + (36) =	68.1385 (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	46.9329	46.6773	46.4268	45.2500	45.0298	44.0049	44.0049	43.8151	44.3997	45.0298	45.4752	45.9409 (38)
Heat transfer coeff	115.0714	114.8158	114.5652	113.3885	113.1683	112.1434	112.1434	111.9536	112.5382	113.1683	113.6137	114.0794 (39)
Average = Sum(39)m / 12 =												113.3874 (39)
HLP	1.1905	1.1878	1.1852	1.1731	1.1708	1.1602	1.1602	1.1582	1.1643	1.1708	1.1754	1.1802 (40)
HLP (average)												1.1731 (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												2.7064 (42)
Average daily hot water use (litres/day)												98.4765 (43)
Daily hot water use	108.3242	104.3851	100.4461	96.5070	92.5679	88.6289	88.6289	92.5679	96.5070	100.4461	104.3851	108.3242 (44)
Energy conte	160.6416	140.4982	144.9816	126.3984	121.2823	104.6574	96.9805	111.2865	112.6156	131.2427	143.2616	155.5729 (45)
Energy content (annual)										Total = Sum(45)m =		1549.4194 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.0962	21.0747	21.7472	18.9598	18.1923	15.6986	14.5471	16.6930	16.8923	19.6864	21.4892	23.3359 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	47.5925	47.1716	43.7074	45.1643	47.1716	47.5925	50.9589	49.3151	50.9589 (61)
Solar input	211.6006	186.5256	195.9405	173.9909	168.4539	148.3648	142.1448	158.4581	160.2081	182.2016	192.5767	206.5318 (62)
Output from w/h	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)
Heat gains from water heating, kWh/month	211.6006	186.5256	195.9405	173.9909	168.4539	148.3648	142.1448	158.4581	160.2081	182.2016	192.5767	206.5318 (64)
	66.1531	58.2225	60.9461	53.9256	52.1193	45.7254	43.5371	48.7957	49.3428	56.3779	59.9633	64.4677 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.3900	19.8866	16.1728	12.2439	9.1524	7.7269	8.3492	10.8526	14.5663	18.4952	21.5867	23.0122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	250.8124	253.4150	246.8564	232.8940	215.2689	198.7038	187.6373	185.0346	191.5932	205.5556	223.1807	239.7458	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	(71)
Water heating gains (Table 5)	88.9154	86.6406	81.9168	74.8967	70.0528	63.5076	58.5176	65.5856	68.5317	75.7768	83.2823	86.6501	(72)
Total internal gains	428.7134	426.5379	411.5418	386.6302	361.0698	336.5339	321.0997	328.0685	341.2869	366.4234	394.6454	416.0039	(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
East					7.4900	19.6403	0.6300	0.7000			0.7700			44.9574 (76)
South					9.1600	46.7521	0.6300	0.7000			0.7700			130.8784 (78)
West					4.1200	19.6403	0.6300	0.7000			0.7700			24.7296 (80)
Solar gains	200.5654	350.6676	497.5413	636.0170	722.8436	720.2422	693.4429	629.5690	546.3271	392.9494	242.0270			170.3982 (83)
Total gains	629.2788	777.2055	909.0831	1022.6472	1083.9134	1056.7761	1014.5426	957.6375	887.6140	759.3728	636.6724			586.4021 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3334	58.4632	58.5911	59.1991	59.3143	59.8564	59.8564	59.9579	59.6464	59.3143	59.0818	58.8406	
alpha	4.8889	4.8975	4.9061	4.9466	4.9543	4.9904	4.9904	4.9972	4.9764	4.9543	4.9388	4.9227	
util living area	0.9971	0.9916	0.9758	0.9279	0.8196	0.6441	0.4794	0.5263	0.7725	0.9563	0.9932	0.9980	(86)
MIT	19.7517	19.9599	20.2527	20.5907	20.8411	20.9641	20.9932	20.9893	20.9120	20.5637	20.0843	19.7135	(87)
Th 2	19.9276	19.9297	19.9318	19.9416	19.9434	19.9520	19.9520	19.9536	19.9487	19.9434	19.9397	19.9359	(88)
util rest of house	0.9962	0.9888	0.9676	0.9038	0.7641	0.5529	0.3689	0.4124	0.6896	0.9365	0.9905	0.9973	(89)
MIT 2	18.2728	18.5770	18.9998	19.4772	19.7951	19.9293	19.9496	19.9494	19.8832	19.4526	18.7667	18.2229	(90)
Living area fraction	18.5132	18.8018	19.2034	19.6581	19.9651	20.0975	20.1192	20.1185	20.0504	19.6332	18.9808	18.4652	(91)
MIT	18.5132	18.8018	19.2034	19.6581	19.9651	20.0975	20.1192	20.1185	20.0504	19.6332	18.9808	18.4652	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5132	18.8018	19.2034	19.6581	19.9651	20.0975	20.1192	20.1185	20.0504	19.6332	18.9808	18.4652	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9942	0.9847	0.9602	0.8960	0.7654	0.5662	0.3869	0.4309	0.6985	0.9289	0.9869	0.9958	(94)
Ext temp.	625.6357	765.2840	872.9223	916.2588	829.6445	598.3437	392.4822	412.6084	619.9688	705.4080	628.3543	583.9304	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1635.5287	1596.1446	1455.3663	1219.8499	935.3497	616.5096	394.6572	416.2951	669.6489	1022.2689	1349.8256	1627.3612	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	751.3604	558.3383	433.3383	218.5856	78.6447	0.0000	0.0000	0.0000	0.0000	235.7444	519.4594	776.3125	(98)
Space heating per m2												3571.7837	(98)
												36.9520	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3824.1795 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	751.3604	558.3383	433.3383	218.5856	78.6447	0.0000	0.0000	0.0000	0.0000	235.7444	519.4594	776.3125 (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)	804.4544	597.7927	463.9597	234.0317	84.2020	0.0000	0.0000	0.0000	0.0000	252.4030	556.1664	831.1697 (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	211.6006	186.5256	195.9405	173.9909	168.4539	148.3648	142.1448	158.4581	160.2081	182.2016	192.5767	206.5318 (64)
Efficiency of water heater (217)m	87.9687	87.6396	86.9930	85.6267	83.2607	80.3000	80.3000	80.3000	80.3000	85.7008	87.4260	80.3000 (216)
Fuel for water heating, kWh/month	240.5408	212.8325	225.2370	203.1970	202.3211	184.7632	177.0172	197.3327	199.5120	212.6019	220.2741	234.5028 (219)
Water heating fuel used												2510.1322 (219)
Annual totals kWh/year												
Space heating fuel - main system												3824.1795 (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)												395.4137 (232)
Total delivered energy for all uses												6804.7255 (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	3824.1795	0.2160	826.0228 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2510.1322	0.2160	542.1886 (264)
Space and water heating			1368.2113 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	395.4137	0.5190	205.2197 (268)
Total CO2, kg/m2/year			1612.3561 (272)
Emissions per m2 for space and water heating			14.1549 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1231 (272b)
Emissions per m2 for pumps and fans			0.4027 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1549 * 1.00) + 2.1231 + 0.4027, rounded to 2 d.p.			16.6800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.3300 (1b)	x 2.3900 (2b)	= 115.5087 (1b) - (3b)
First floor	48.3300 (1c)	x 2.6700 (2c)	= 129.0411 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 244.5498 (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) = 0.1227 (8)
Pressure test					Yes
Measured/design AP50					4.7200
Infiltration rate					0.3587 (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) =				0.3049 (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	0.3887	0.3811	0.3735	0.3354	0.3277	0.2896	0.2896	0.2820	0.3049	0.3277	0.3430	0.3582 (22b)
Effective ac	0.5755	0.5726	0.5697	0.5562	0.5537	0.5419	0.5419	0.5398	0.5465	0.5537	0.5588	0.5642 (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)			20.7700	1.1450	23.7824		(27)
Ground Floor			48.3300	0.1100	5.3163	140.0000	6766.2000 (28a)
Brick and Block	100.3900	22.8900	77.5000	0.2400	18.6000	42.2200	3272.0500 (29a)
Pitched Roof	48.3300		48.3300	0.1000	4.8330	9.0000	434.9700 (30)
Total net area of external elements Aum(A, m ²)			197.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8637		(33)
Party Wall 1			44.1900	0.0000	0.0000	110.0000	4860.9000 (32)
Ground Floor Block			52.6600			75.0000	3949.5000 (32c)
Ground Floor Stud			36.6800			9.0000	330.1200 (32c)
First Floor Stud			116.5700			9.0000	1049.1300 (32c)
Internal Floor 1			48.3300			18.0000	869.9400 (32d)
Internal Ceiling 1			48.3300			9.0000	434.9700 (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) = 21967.7800 (34)
227.2686 (35)
7.4197 (36)
(33) + (36) = 62.2834 (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	46.4476	46.2109	45.9788	44.8888	44.6849	43.7355	43.7355	43.5597	44.1012	44.6849	45.0975	45.5288 (38)
Heat transfer coeff	108.7310	108.4943	108.2622	107.1722	106.9683	106.0189	106.0189	105.8431	106.3846	106.9683	107.3808	107.8122 (39)
Average = Sum(39)m / 12 =												107.1712 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1249	1.1224	1.1200	1.1088	1.1066	1.0968	1.0968	1.0950	1.1006	1.1066	1.1109	1.1154 (40)
HLP (average)												1.1087 (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)
2.7064 (42)
98.4765 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.3242	104.3851	100.4461	96.5070	92.5679	88.6289	88.6289	92.5679	96.5070	100.4461	104.3851	108.3242 (44)
Energy conte	160.6416	140.4982	144.9816	126.3984	121.2823	104.6574	96.9805	111.2865	112.6156	131.2427	143.2616	155.5729 (45)

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Energy content (annual)	Total = Sum(45)m = 1549.4194 (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	34.1363	29.8559	30.8086	26.8597	25.7725	22.2397	20.6084	23.6484	23.9308	27.8891	30.4431	33.0592 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.3900	19.8866	16.1728	12.2439	9.1524	7.7269	8.3492	10.8526	14.5663	18.4952	21.5867	23.0122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	250.8124	253.4150	246.8564	232.8940	215.2689	198.7038	187.6373	185.0346	191.5932	205.5556	223.1807	239.7458	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	(71)
Water heating gains (Table 5)	45.8822	44.4284	41.4094	37.3051	34.6404	30.8885	27.6994	31.7855	33.2373	37.4853	42.2821	44.4345	(72)
Total internal gains	382.6802	381.3256	368.0343	346.0386	322.6575	300.9148	287.2815	291.2683	302.9924	325.1319	350.6452	370.7883	(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			
East				7.4900	19.6403	0.6300	0.7000	0.7700	44.9574 (76)			
South				9.1600	46.7521	0.6300	0.7000	0.7700	130.8784 (78)			
West				4.1200	19.6403	0.6300	0.7000	0.7700	24.7296 (80)			
Solar gains	200.5654	350.6676	497.5413	636.0170	722.8436	720.2422	693.4429	629.5690	546.3271	392.9494	242.0270	170.3982 (83)
Total gains	583.2456	731.9932	865.5757	982.0557	1045.5011	1021.1570	980.7244	920.8374	849.3196	718.0813	592.6722	541.1864 (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	56.1216	56.2441	56.3646	56.9379	57.0465	57.5573	57.5573	57.6529	57.3594	57.0465	56.8273	56.5999	
alpha	4.7414	4.7496	4.7576	4.7959	4.8031	4.8372	4.8372	4.8435	4.8240	4.8031	4.7885	4.7733	
util living area	0.9969	0.9906	0.9727	0.9201	0.8065	0.6305	0.4687	0.5171	0.7629	0.9530	0.9927	0.9978	(86)
MIT	19.7014	19.9247	20.2335	20.5850	20.8399	20.9633	20.9928	20.9886	20.9090	20.5479	20.0461	19.6601	(87)
Th 2	19.9806	19.9826	19.9845	19.9937	19.9954	20.0034	20.0034	20.0049	20.0003	19.9954	19.9919	19.9883	(88)
util rest of house	0.9959	0.9878	0.9644	0.8961	0.7536	0.5454	0.3661	0.4109	0.6849	0.9338	0.9901	0.9971	(89)
MIT 2	18.7980	19.0212	19.3262	19.6677	19.8904	19.9866	20.0015	20.0016	19.9517	19.6423	19.1506	18.7630	(90)
Living area fraction	18.9448	19.1681	19.4737	19.8168	20.0447	20.1453	20.1626	20.1620	20.1073	19.7895	19.2961	18.9088	(91)
MIT	18.9448	19.1681	19.4737	19.8168	20.0447	20.1453	20.1626	20.1620	20.1073	19.7895	19.2961	18.9088	(92)
Temperature adjustment	18.9448	19.1681	19.4737	19.8168	20.0447	20.1453	20.1626	20.1620	20.1073	19.7895	19.2961	18.9088	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	580.0763	720.8388	830.1983	875.2105	790.8910	569.9331	375.3980	394.2575	589.5006	666.9968	585.3142	539.0764	(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	1592.3435	1548.0030	1404.5605	1169.9756	892.6217	587.9118	377.7053	398.1825	639.0836	982.9803	1309.6277	1585.7831	(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	753.1268	555.8543	427.3255	212.2309	75.6877	0.0000	0.0000	0.0000	0.0000	235.0917	521.5057	778.7498	(98)
Space heating												3559.5722	(98)
Space heating per m2												36.8257	(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	996.5780	784.5402	804.4078	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9175	0.9578	0.9442	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	914.3267	751.4171	759.4834	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1296.6923	1247.2179	1179.0201	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	275.3032	368.8758	312.1353	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												956.3142 (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	68.8258	92.2189	78.0338	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												239.0786 (107)
Space cooling per m2												2.4734 (108)
Energy for space heating												36.8257 (99)
Energy for space cooling												2.4734 (108)
Total												39.2991 (109)
Dwelling Fabric Energy Efficiency (DFEE)												39.3 (109)

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Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.3300 (1b)	x 2.3900 (2b)	= 115.5087 (1b) - (3b)
First floor	48.3300 (1c)	x 2.6700 (2c)	= 129.0411 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 244.5498 (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) = 0.1227 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3727 (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) =	0.3168 (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	0.4039	0.3960	0.3880	0.3485	0.3405	0.3009	0.3009	0.2930	0.3168	0.3405	0.3564	0.3722 (22b)
Effective ac	0.5816	0.5784	0.5753	0.5607	0.5580	0.5453	0.5453	0.5429	0.5502	0.5580	0.5635	0.5693 (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)			20.7700	1.3258	27.5360		(27)
Ground Floor			48.3300	0.1300	6.2829		(28a)
Brick and Block	100.3900	22.8900	77.5000	0.1800	13.9500		(29a)
Pitched Roof	48.3300		48.3300	0.1300	6.2829		(30)
Total net area of external elements Aum(A, m ²)			197.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.5958		(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)							11.5427 (36)
Total fabric heat loss						(33) + (36) =	68.1385 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	46.9329	46.6773	46.4268	45.2500	45.0298	44.0049	44.0049	43.8151	44.3997	45.0298	45.4752	45.9409 (38)
Average = Sum(39)m / 12 =	115.0714	114.8158	114.5652	113.3885	113.1683	112.1434	112.1434	111.9536	112.5382	113.1683	113.6137	114.0794 (39)
												113.3874 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1905	1.1878	1.1852	1.1731	1.1708	1.1602	1.1602	1.1582	1.1643	1.1708	1.1754	1.1802 (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												2.7064 (42)
Average daily hot water use (litres/day)												98.4765 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	108.3242	104.3851	100.4461	96.5070	92.5679	88.6289	88.6289	92.5679	96.5070	100.4461	104.3851	108.3242 (44)
Energy content (annual)	160.6416	140.4982	144.9816	126.3984	121.2823	104.6574	96.9805	111.2865	112.6156	131.2427	143.2616	155.5729 (45)
Distribution loss (46)m = 0.15 x (45)m												1549.4194 (45)
Water 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 (46)
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 (46)
If cylinder contains dedicated solar storage												

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	34.1363	29.8559	30.8086	26.8597	25.7725	22.2397	20.6084	23.6484	23.9308	27.8891	30.4431	33.0592 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190	135.3190 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.3900	19.8866	16.1728	12.2439	9.1524	7.7269	8.3492	10.8526	14.5663	18.4952	21.5867	23.0122 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	250.8124	253.4150	246.8564	232.8940	215.2689	198.7038	187.6373	185.0346	191.5932	205.5556	223.1807	239.7458 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319	36.5319 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552 (71)
Water heating gains (Table 5)	45.8822	44.4284	41.4094	37.3051	34.6404	30.8885	27.6994	31.7855	33.2373	37.4853	42.2821	44.4345 (72)
Total internal gains	382.6802	381.3256	368.0343	346.0386	322.6575	300.9148	287.2815	291.2683	302.9924	325.1319	350.6452	370.7883 (73)

6. Solar gains												

[Jan]				Area	Solar flux		g		FF		Access	Gains
				m2	Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
East				7.4900	19.6403		0.6300		0.7000		0.7700	44.9574 (76)
South				9.1600	46.7521		0.6300		0.7000		0.7700	130.8784 (78)
West				4.1200	19.6403		0.6300		0.7000		0.7700	24.7296 (80)

Solar gains	200.5654	350.6676	497.5413	636.0170	722.8436	720.2422	693.4429	629.5690	546.3271	392.9494	242.0270	170.3982 (83)
Total gains	583.2456	731.9932	865.5757	982.0557	1045.5011	1021.1570	980.7244	920.8374	849.3196	718.0813	592.6722	541.1864 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.3334	58.4632	58.5911	59.1991	59.3143	59.8564	59.8564	59.9579	59.6464	59.3143	59.0818	58.8406
alpha	4.8889	4.8975	4.9061	4.9466	4.9543	4.9904	4.9904	4.9972	4.9764	4.9543	4.9388	4.9227
util living area	0.9980	0.9935	0.9800	0.9370	0.8348	0.6620	0.4949	0.5453	0.7933	0.9644	0.9950	0.9986 (86)
MIT	19.7079	19.9180	20.2152	20.5629	20.8261	20.9595	20.9922	20.9876	20.9004	20.5311	20.0430	19.6703 (87)
Th 2	19.9276	19.9297	19.9318	19.9416	19.9434	19.9520	19.9520	19.9536	19.9487	19.9434	19.9397	19.9359 (88)
util rest of house	0.9972	0.9913	0.9731	0.9151	0.7814	0.5699	0.3813	0.4283	0.7123	0.9476	0.9930	0.9981 (89)
MIT 2	18.7542	18.9648	19.2594	19.5998	19.8312	19.9343	19.9501	19.9502	19.8971	19.5786	19.0981	18.7232 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9092	19.1197	19.4147	19.7563	19.9929	20.1010	20.1195	20.1188	20.0601	19.7334	19.2517	18.8771 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9092	19.1197	19.4147	19.7563	19.9929	20.1010	20.1195	20.1188	20.0601	19.7334	19.2517	18.8771 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9963	0.9891	0.9688	0.9105	0.7842	0.5838	0.3999	0.4474	0.7219	0.9433	0.9912	0.9974 (94)
Ext temp.	581.0877	723.9804	838.5518	894.1655	819.8621	596.1363	392.1626	411.9803	613.1192	677.3532	587.4443	539.7747 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1681.0978	1632.6449	1479.5792	1230.9798	938.4922	616.8960	394.6849	416.3368	670.7445	1033.6113	1380.5970	1674.3549 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	818.4075	610.6226	476.9244	242.5062	88.2608	0.0000	0.0000	0.0000	0.0000	265.0560	571.0699	844.1277 (98)
Space heating	3916.9752 (98)											
Space heating per m2	(98) / (4) =											

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1054.1482	829.8614	850.8476	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9064	0.9520	0.9365	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	955.4490	790.0357	796.8118	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1296.6923	1247.2179	1179.0201	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	245.6952	340.1435	284.3630	0.0000	0.0000	0.0000	0.0000 (104)
	870.2016 (104)											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.4238	85.0359	71.0907	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												217.5504 (107)
Space cooling per m2												2.2507 (108)
Energy for space heating												40.5232 (99)
Energy for space cooling												2.2507 (108)
Total												42.7739 (109)
Target Fabric Energy Efficiency (TFEE)												49.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.3300 (1b)	x 2.3900 (2b)	= 115.5087 (1b) - (3b)
First floor	48.3300 (1c)	x 2.6700 (2c)	= 129.0411 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 244.5498 (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) = 0.1227 (8)
Pressure test					Yes
Measured/design AP50					4.7200
Infiltration rate					0.3587 (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) =	0.3049 (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	0.3201	0.2973	0.3049	0.2896	0.2896	0.2820	0.2744	0.2668	0.2591	0.2820	0.2668	0.2820 (22b)
Effective ac	0.5512	0.5442	0.5465	0.5419	0.5419	0.5398	0.5376	0.5356	0.5336	0.5398	0.5356	0.5398 (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)			20.7700	1.1450	23.7824		(27)
Ground Floor			48.3300	0.1100	5.3163	140.0000	6766.2000 (28a)
Brick and Block	100.3900	22.8900	77.5000	0.2400	18.6000	42.2200	3272.0500 (29a)
Pitched Roof	48.3300		48.3300	0.1000	4.8330	9.0000	434.9700 (30)
Total net area of external elements Aum(A, m ²)			197.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8637		(33)
Party Wall 1			44.1900	0.0000	0.0000	110.0000	4860.9000 (32)
Ground Floor Block			52.6600			75.0000	3949.5000 (32c)
Ground Floor Stud			36.6800			9.0000	330.1200 (32c)
First Floor Stud			116.5700			9.0000	1049.1300 (32c)
Internal Floor 1			48.3300			18.0000	869.9400 (32d)
Internal Ceiling 1			48.3300			18.0000	869.9400 (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) = 22402.7500 (34)
231.7686 (35)
7.4197 (36)
(33) + (36) = 62.2834 (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	44.4856	43.9160	44.1012	43.7355	43.7355	43.5597	43.3886	43.2222	43.0605	43.5597	43.2222	43.5597 (38)
Heat transfer coeff	106.7690	106.1994	106.3846	106.0189	106.0189	105.8431	105.6720	105.5056	105.3439	105.8431	105.5056	105.8431 (39)
Average = Sum(39)m / 12 =												105.9123 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1046	1.0987	1.1006	1.0968	1.0968	1.0950	1.0932	1.0915	1.0898	1.0950	1.0915	1.0950 (40)
HLP (average)												1.0957 (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)
2.7064 (42)
98.4765 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.3242	104.3851	100.4461	96.5070	92.5679	88.6289	88.6289	92.5679	96.5070	100.4461	104.3851	108.3242 (44)
Energy conte	160.6416	140.4982	144.9816	126.3984	121.2823	104.6574	96.9805	111.2865	112.6156	131.2427	143.2616	155.5729 (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 = 1549.4194 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.0962	21.0747	21.7472	18.9598	18.1923	15.6986	14.5471	16.6930	16.8923	19.6864	21.4892	23.3359 (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	28.4522	25.6969	28.4459	27.5210	28.4328	27.5093	28.4223	28.4291	27.5157	28.4404	27.5295	28.4502 (61)
Total heat required for water heating calculated for each month	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
												Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230 (64)
												Total per year (kWh/year) = Sum(64)m = 1884.2648 (64)
RHI water heating demand	60.5264	53.1399	55.3179	48.9077	47.4346	41.6759	39.3516	44.1101	44.3236	50.7483	54.5169	58.8405 (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	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.9749	49.7164	40.4321	30.6097	22.8811	19.3172	20.8729	27.1314	36.4157	46.2381	53.9667	57.5306	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	374.3468	378.2313	368.4424	347.6029	321.2968	296.5728	280.0556	276.1711	285.9600	306.7995	333.1056	357.8296	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	(71)
Water heating gains (Table 5)	81.3527	79.0772	74.3520	67.9274	63.7562	57.8832	52.8919	59.2877	61.5606	68.2101	75.7179	79.0867	(72)
Total internal gains	622.7467	618.0972	594.2987	557.2123	519.0064	484.8455	464.8927	473.6624	495.0086	532.3199	573.8624	605.5192	(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		
East					7.4900	25.1925		0.6300	0.7000	0.7700	57.6668 (76)		
South					9.1600	56.7559		0.6300	0.7000	0.7700	158.8832 (78)		
West					4.1200	25.1925		0.6300	0.7000	0.7700	31.7206 (80)		

Solar gains	248.2706	369.4252	529.0004	682.7123	740.3844	803.0230	766.3765	710.4746	614.1767	446.7342	298.6014	207.3657	(83)
Total gains	871.0172	987.5225	1123.2992	1239.9247	1259.3908	1287.8685	1231.2692	1184.1370	1109.1853	979.0541	872.4639	812.8850	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.2846	58.5972	58.4952	58.6969	58.6969	58.7944	58.8896	58.9825	59.0731	58.7944	58.9825	58.7944
alpha	4.8856	4.9065	4.8997	4.9131	4.9131	4.9196	4.9260	4.9322	4.9382	4.9196	4.9322	4.9196
util living area	0.9819	0.9673	0.9239	0.8238	0.6699	0.4624	0.3337	0.3463	0.5784	0.8461	0.9592	0.9858 (86)
MIT	20.1015	20.2584	20.5299	20.7940	20.9402	20.9919	20.9987	20.9985	20.9769	20.8044	20.4314	20.0702 (87)
Th 2	19.9971	20.0019	20.0003	20.0034	20.0034	20.0049	20.0064	20.0078	20.0091	20.0049	20.0078	20.0049 (88)
util rest of house	0.9767	0.9584	0.9041	0.7833	0.6056	0.3845	0.2492	0.2588	0.4956	0.7997	0.9460	0.9816 (89)
MIT 2	19.2053	19.3616	19.6178	19.8552	19.9692	20.0019	20.0061	20.0075	19.9991	19.8717	19.5363	19.1813 (90)
Living area fraction									fLA = Living area / (4) =			0.1625 (91)
MIT	19.3509	19.5073	19.7661	20.0078	20.1270	20.1628	20.1674	20.1685	20.1580	20.0233	19.6818	19.3258 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3509	19.5073	19.7661	20.0078	20.1270	20.1628	20.1674	20.1685	20.1580	20.0233	19.6818	19.3258 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9724	0.9530	0.8988	0.7835	0.6140	0.3970	0.2630	0.2731	0.5084	0.8006	0.9407	0.9778	(94)
Useful gains	846.9690	941.0896	1009.5655	971.5215	773.2110	511.2911	323.8080	323.3549	563.9545	783.8727	820.7502	794.8786	(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	1542.9141	1508.8102	1358.1141	1114.0242	808.6093	514.6973	324.1415	323.7475	574.9716	912.7150	1243.0475	1516.2889	(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	517.7831	381.5082	259.3201	102.6020	26.3363	0.0000	0.0000	0.0000	0.0000	95.8586	304.0540	536.7293	(98)
Space heating												2224.1917	(98)
RHI space heating demand												2224	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.3300 (1b)	x 2.3900 (2b)	= 115.5087 (1b) - (3b)
First floor	48.3300 (1c)	x 2.6700 (2c)	= 129.0411 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 244.5498 (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) = 0.1227 (8)
Pressure test					Yes
Measured/design AP50					4.7200
Infiltration rate					0.3587 (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) =	0.3049 (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	0.3887	0.3811	0.3735	0.3354	0.3277	0.2896	0.2896	0.2820	0.3049	0.3277	0.3430	0.3582 (22b)
Effective ac	0.5755	0.5726	0.5697	0.5562	0.5537	0.5419	0.5419	0.5398	0.5465	0.5537	0.5588	0.5642 (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)			20.7700	1.1450	23.7824		(27)
Ground Floor			48.3300	0.1100	5.3163	140.0000	6766.2000 (28a)
Brick and Block	100.3900	22.8900	77.5000	0.2400	18.6000	42.2200	3272.0500 (29a)
Pitched Roof	48.3300		48.3300	0.1000	4.8330	9.0000	434.9700 (30)
Total net area of external elements Aum(A, m ²)			197.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8637		(33)
Party Wall 1			44.1900	0.0000	0.0000	110.0000	4860.9000 (32)
Ground Floor Block			52.6600			75.0000	3949.5000 (32c)
Ground Floor Stud			36.6800			9.0000	330.1200 (32c)
First Floor Stud			116.5700			9.0000	1049.1300 (32c)
Internal Floor 1			48.3300			18.0000	869.9400 (32d)
Internal Ceiling 1			48.3300			18.0000	869.9400 (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) = 22402.7500 (34)
231.7686 (35)
7.4197 (36)
(33) + (36) = 62.2834 (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	46.4476	46.2109	45.9788	44.8888	44.6849	43.7355	43.7355	43.5597	44.1012	44.6849	45.0975	45.5288 (38)
Heat transfer coeff	108.7310	108.4943	108.2622	107.1722	106.9683	106.0189	106.0189	105.8431	106.3846	106.9683	107.3808	107.8122 (39)
Average = Sum(39)m / 12 =												107.1712 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1249	1.1224	1.1200	1.1088	1.1066	1.0968	1.0968	1.0950	1.1006	1.1066	1.1109	1.1154 (40)
HLP (average)												1.1087 (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)
2.7064 (42)
98.4765 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.3242	104.3851	100.4461	96.5070	92.5679	88.6289	88.6289	92.5679	96.5070	100.4461	104.3851	108.3242 (44)
Energy conte	160.6416	140.4982	144.9816	126.3984	121.2823	104.6574	96.9805	111.2865	112.6156	131.2427	143.2616	155.5729 (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 = 1549.4194 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.0962	21.0747	21.7472	18.9598	18.1923	15.6986	14.5471	16.6930	16.8923	19.6864	21.4892	23.3359 (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	28.4522	25.6969	28.4459	27.5210	28.4328	27.5093	28.4223	28.4291	27.5157	28.4404	27.5295	28.4502 (61)
Total heat required for water heating calculated for each month	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
	Solar input (sum of months) = Sum(63)m = 0.0000 (63)											
Output from w/h	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230 (64)
	Total per year (kWh/year) = Sum(64)m = 1884.2648 (64)											
Heat gains from water heating, kWh/month	60.5264	53.1399	55.3179	48.9077	47.4346	41.6759	39.3516	44.1101	44.3236	50.7483	54.5169	58.8405 (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	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.9749	49.7164	40.4321	30.6097	22.8811	19.3172	20.8729	27.1314	36.4157	46.2381	53.9667	57.5306	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	374.3468	378.2313	368.4424	347.6029	321.2968	296.5728	280.0556	276.1711	285.9600	306.7995	333.1056	357.8296	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	(71)
Water heating gains (Table 5)	81.3527	79.0772	74.3520	67.9274	63.7562	57.8832	52.8919	59.2877	61.5606	68.2101	75.7179	79.0867	(72)
Total internal gains	622.7467	618.0972	594.2987	557.2123	519.0064	484.8455	464.8927	473.6624	495.0086	532.3199	573.8624	605.5192	(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			
East				7.4900	19.6403	0.6300	0.7000	0.7700	44.9574 (76)			
South				9.1600	46.7521	0.6300	0.7000	0.7700	130.8784 (78)			
West				4.1200	19.6403	0.6300	0.7000	0.7700	24.7296 (80)			
Solar gains	200.5654	350.6676	497.5413	636.0170	722.8436	720.2422	693.4429	629.5690	546.3271	392.9494	242.0270	170.3982 (83)
Total gains	823.3120	968.7648	1091.8401	1193.2293	1241.8500	1205.0877	1158.3356	1103.2315	1041.3357	925.2693	815.8894	775.9174 (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	57.2328	57.3577	57.4807	58.0653	58.1760	58.6969	58.6969	58.7944	58.4952	58.1760	57.9525	57.7206
alpha	4.8155	4.8238	4.8320	4.8710	4.8784	4.9131	4.9131	4.9196	4.8997	4.8784	4.8635	4.8480
util living area	0.9878	0.9732	0.9401	0.8623	0.7269	0.5479	0.3999	0.4369	0.6620	0.8965	0.9753	0.9906 (86)
MIT	19.9612	20.1666	20.4365	20.7215	20.9043	20.9810	20.9967	20.9949	20.9534	20.7057	20.2760	19.9177 (87)
Th 2	19.9806	19.9826	19.9845	19.9937	19.9954	20.0034	20.0034	20.0049	20.0003	19.9954	19.9919	19.9883 (88)
util rest of house	0.9842	0.9658	0.9241	0.8282	0.6686	0.4688	0.3108	0.3446	0.5817	0.8623	0.9671	0.9878 (89)
MIT 2	19.0537	19.2562	19.5169	19.7851	19.9361	19.9952	20.0026	20.0035	19.9775	19.7800	19.3735	19.0170 (90)
Living area fraction	19.2012	19.4042	19.6664	19.9373	20.0934	20.1554	20.1642	20.1646	20.1361	19.9305	19.5202	19.1634 (92)
MIT	19.2012	19.4042	19.6664	19.9373	20.0934	20.1554	20.1642	20.1646	20.1361	19.9305	19.5202	19.1634 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2012	19.4042	19.6664	19.9373	20.0934	20.1554	20.1642	20.1646	20.1361	19.9305	19.5202	19.1634 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	807.4578	930.6391	1002.5119	985.6561	837.8101	579.9135	376.8296	396.7591	617.6933	795.4593	785.1422	764.1698	(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	1620.2193	1573.6229	1425.4215	1182.8881	897.8321	588.9814	377.8676	398.4611	642.1456	998.0626	1333.6897	1613.2381	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	604.6945	432.0851	314.6447	142.0071	44.6564	0.0000	0.0000	0.0000	0.0000	150.7368	394.9542	631.7068	(98)
Space heating												2715.4857	(98)
Space heating per m2												28.0932	(99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3010.5163 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	604.6945	432.0851	314.6447	142.0071	44.6564	0.0000	0.0000	0.0000	0.0000	150.7368	394.9542	631.7068	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	670.3931	479.0301	348.8301	157.4358	49.5082	0.0000	0.0000	0.0000	0.0000	167.1140	437.8650	700.3402	(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	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230	(64)
Efficiency of water heater	89.5667	89.4624	89.2586	88.8287	88.1840	87.6000	87.6000	87.6000	87.6000	88.8435	89.3990	89.6001	(216)
(217)m	89.5667	89.4624	89.2586	88.8287	88.1840	87.6000	87.6000	87.6000	87.6000	88.8435	89.3990	89.6001	(217)
Fuel for water heating, kWh/month	211.1206	185.7709	194.2977	173.2767	169.7759	150.8753	143.1539	159.4928	159.9672	179.7352	191.0437	205.3827	(219)
Water heating fuel used												2123.8926	(219)
Annual totals kWh/year													
Space heating fuel - main system												3010.5163	(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)													395.4137 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1068 * 1.00) =										-1025.3477		-1025.3477	(233)
Total delivered energy for all uses												4579.4750	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3010.5163	3.4800	104.7660 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2123.8926	3.4800	73.9115 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	395.4137	13.1900	52.1551 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1025.3477	13.1900	-135.2434 (252)
Total energy cost			225.4816 (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] =	0.6685 (257)
SAP value		90.6742
SAP rating (Section 12)		91 (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	3010.5163	0.2160	650.2715 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2123.8926	0.2160	458.7608 (264)
Space and water heating			1109.0323 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	395.4137	0.5190	205.2197 (268)
Energy saving/generation technologies			
PV Unit	-1025.3477	0.5190	-532.1554 (269)
Total kg/year			821.0216 (272)
CO2 emissions per m2			8.4900 (273)
EI value			92.2337
EI rating			92 (274)
EI band			A

Calculation of stars for heating and DHW

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8863 = 3.926$, stars = 4
Water heating environmental impact	$0.216 / 0.8863 = 0.2437$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.3300 (1b)	x 2.3900 (2b)	= 115.5087 (1b) - (3b)
First floor	48.3300 (1c)	x 2.6700 (2c)	= 129.0411 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 244.5498 (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) = 0.1227 (8)
Pressure test					Yes
Measured/design AP50					4.7200
Infiltration rate					0.3587 (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) =	0.3049 (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	0.3201	0.2973	0.3049	0.2896	0.2896	0.2820	0.2744	0.2668	0.2591	0.2820	0.2668	0.2820 (22b)
Effective ac	0.5512	0.5442	0.5465	0.5419	0.5419	0.5398	0.5376	0.5356	0.5336	0.5398	0.5356	0.5398 (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)			20.7700	1.1450	23.7824		(27)
Ground Floor			48.3300	0.1100	5.3163	140.0000	6766.2000 (28a)
Brick and Block	100.3900	22.8900	77.5000	0.2400	18.6000	42.2200	3272.0500 (29a)
Pitched Roof	48.3300		48.3300	0.1000	4.8330	9.0000	434.9700 (30)
Total net area of external elements Aum(A, m ²)			197.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8637		(33)
Party Wall 1			44.1900	0.0000	0.0000	110.0000	4860.9000 (32)
Ground Floor Block			52.6600			75.0000	3949.5000 (32c)
Ground Floor Stud			36.6800			9.0000	330.1200 (32c)
First Floor Stud			116.5700			9.0000	1049.1300 (32c)
Internal Floor 1			48.3300			18.0000	869.9400 (32d)
Internal Ceiling 1			48.3300			18.0000	869.9400 (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) = 22402.7500 (34)
231.7686 (35)
7.4197 (36)
(33) + (36) = 62.2834 (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	44.4856	43.9160	44.1012	43.7355	43.7355	43.5597	43.3886	43.2222	43.0605	43.5597	43.2222	43.5597 (38)
Heat transfer coeff	106.7690	106.1994	106.3846	106.0189	106.0189	105.8431	105.6720	105.5056	105.3439	105.8431	105.5056	105.8431 (39)
Average = Sum(39)m / 12 =												105.9123 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1046	1.0987	1.1006	1.0968	1.0968	1.0950	1.0932	1.0915	1.0898	1.0950	1.0915	1.0950 (40)
HLP (average)												1.0957 (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												2.7064 (42)
Average daily hot water use (litres/day)												98.4765 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.3242	104.3851	100.4461	96.5070	92.5679	88.6289	88.6289	92.5679	96.5070	100.4461	104.3851	108.3242 (44)
Energy conte	160.6416	140.4982	144.9816	126.3984	121.2823	104.6574	96.9805	111.2865	112.6156	131.2427	143.2616	155.5729 (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 = 1549.4194 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.0962	21.0747	21.7472	18.9598	18.1923	15.6986	14.5471	16.6930	16.8923	19.6864	21.4892	23.3359 (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	28.4522	25.6969	28.4459	27.5210	28.4328	27.5093	28.4223	28.4291	27.5157	28.4404	27.5295	28.4502 (61)
Total heat required for water heating calculated for each month	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
	Solar input (sum of months) = Sum(63)m = 0.0000 (63)											
Output from w/h	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230 (64)
	Total per year (kWh/year) = Sum(64)m = 1884.2648 (64)											
Heat gains from water heating, kWh/month	60.5264	53.1399	55.3179	48.9077	47.4346	41.6759	39.3516	44.1101	44.3236	50.7483	54.5169	58.8405 (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	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.9749	49.7164	40.4321	30.6097	22.8811	19.3172	20.8729	27.1314	36.4157	46.2381	53.9667	57.5306	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	374.3468	378.2313	368.4424	347.6029	321.2968	296.5728	280.0556	276.1711	285.9600	306.7995	333.1056	357.8296	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	(71)
Water heating gains (Table 5)	81.3527	79.0772	74.3520	67.9274	63.7562	57.8832	52.8919	59.2877	61.5606	68.2101	75.7179	79.0867	(72)
Total internal gains	622.7467	618.0972	594.2987	557.2123	519.0064	484.8455	464.8927	473.6624	495.0086	532.3199	573.8624	605.5192	(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		
East					7.4900	25.1925	0.6300	0.7000	0.7700	57.6668 (76)		
South					9.1600	56.7559	0.6300	0.7000	0.7700	158.8832 (78)		
West					4.1200	25.1925	0.6300	0.7000	0.7700	31.7206 (80)		
Solar gains	248.2706	369.4252	529.0004	682.7123	740.3844	803.0230	766.3765	710.4746	614.1767	446.7342	298.6014	207.3657 (83)
Total gains	871.0172	987.5225	1123.2992	1239.9247	1259.3908	1287.8685	1231.2692	1184.1370	1109.1853	979.0541	872.4639	812.8850 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.2846	58.5972	58.4952	58.6969	58.6969	58.7944	58.8896	58.9825	59.0731	58.7944	58.9825	58.7944
alpha	4.8856	4.9065	4.8997	4.9131	4.9131	4.9196	4.9260	4.9322	4.9382	4.9196	4.9322	4.9196
util living area	0.9819	0.9673	0.9239	0.8238	0.6699	0.4624	0.3337	0.3463	0.5784	0.8461	0.9592	0.9858 (86)
MIT	20.1015	20.2584	20.5299	20.7940	20.9402	20.9919	20.9987	20.9985	20.9769	20.8044	20.4314	20.0702 (87)
Th 2	19.9971	20.0019	20.0003	20.0034	20.0034	20.0049	20.0064	20.0078	20.0091	20.0049	20.0078	20.0049 (88)
util rest of house	0.9767	0.9584	0.9041	0.7833	0.6056	0.3845	0.2492	0.2588	0.4956	0.7997	0.9460	0.9816 (89)
MIT 2	19.2053	19.3616	19.6178	19.8552	19.9692	20.0019	20.0061	20.0075	19.9991	19.8717	19.5363	19.1813 (90)
Living area fraction	19.3509	19.5073	19.7661	20.0078	20.1270	20.1628	20.1674	20.1685	20.1580	20.0233	19.6818	19.3258 (91)
MIT	19.3509	19.5073	19.7661	20.0078	20.1270	20.1628	20.1674	20.1685	20.1580	20.0233	19.6818	19.3258 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3509	19.5073	19.7661	20.0078	20.1270	20.1628	20.1674	20.1685	20.1580	20.0233	19.6818	19.3258 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	846.9690	941.0896	1009.5655	971.5215	773.2110	511.2911	323.8080	323.3549	563.9545	783.8727	820.7502	794.8786	(94)
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	1542.9141	1508.8102	1358.1141	1114.0242	808.6093	514.6973	324.1415	323.7475	574.9716	912.7150	1243.0475	1516.2889	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	517.7831	381.5082	259.3201	102.6020	26.3363	0.0000	0.0000	0.0000	0.0000	95.8586	304.0540	536.7293	(98)
Space heating												2224.1917	(98)
Space heating per m2												23.0105	(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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2465.8445 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	517.7831	381.5082	259.3201	102.6020	26.3363	0.0000	0.0000	0.0000	0.0000	95.8586	304.0540	536.7293	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	574.0389	422.9581	287.4946	113.7494	29.1977	0.0000	0.0000	0.0000	0.0000	106.2734	337.0887	595.0435	(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	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230	(64)
Efficiency of water heater (217)m	89.4895	89.3949	89.1397	88.6217	87.9794	87.6000	87.6000	87.6000	87.6000	88.5576	89.2473	89.5216	(216)
Fuel for water heating, kWh/month	211.3029	185.9112	194.5569	173.6814	170.1708	150.8753	143.1539	159.4928	159.9672	180.3156	191.3685	205.5627	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2465.8445 (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)													395.4137 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1187 * 1.00) =										-1139.0766			-1139.0766 (233)
Total delivered energy for all uses													3923.5408 (238)

10a. Fuel costs - using BEDF prices (535)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2465.8445	7.6100	187.6508 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2126.3591	7.6100	161.8159 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	395.4137	31.0800	122.8946 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1139.0766	31.0800	-354.0250 (252)
Total energy cost			246.6463 (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	2465.8445	0.2160	532.6224 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2126.3591	0.2160	459.2936 (264)
Space and water heating			991.9160 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	395.4137	0.5190	205.2197 (268)
Energy saving/generation technologies			
PV Unit	-1139.0766	0.5190	-591.1807 (269)
Total kg/year			644.8800 (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	2465.8445	1.2200	3008.3303 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2126.3591	1.2200	2594.1581 (264)
Space and water heating			5602.4884 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	395.4137	3.0700	1213.9202 (268)
Energy saving/generation technologies			
PV Unit	-1139.0766	3.0700	-3496.9650 (269)
Primary energy kWh/year			3549.6936 (272)
Primary energy kWh/m2/year			36.7235 (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 91
Current environmental impact rating: A 92

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 62	-195 kg (30.3%)

		Typical annual savings	Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£62	2.02 kg/m²	A 92	A 94
Total Savings	£62	2.02 kg/m²		
Potential energy efficiency rating:			A 92	
Potential environmental impact rating:				A 94

Fuel prices for cost data on this page from database revision number 535 TEST (04 Jan 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£146	£162	-£16
Mains gas	£454	£377	£78
Space heating	£316	£316	£0
Water heating	£162	£99	£62
Lighting	£123	£123	£0
Generated (PV)	-£354	-£354	£0
Total cost of fuels	£246	£185	£62
Total cost of uses	£247	£184	£62
Delivered energy	41 kWh/m²	31 kWh/m²	10 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.4 tonnes	0.2 tonnes
CO2 emissions per m²	7 kg/m²	5 kg/m²	2 kg/m²
Primary energy	37 kWh/m²	25 kWh/m²	11 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.3300 (1b)	x 2.3900 (2b)	= 115.5087 (1b) - (3b)
First floor	48.3300 (1c)	x 2.6700 (2c)	= 129.0411 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 244.5498 (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) = 0.1227 (8)
Pressure test					Yes
Measured/design AP50					4.7200
Infiltration rate					0.3587 (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) =	0.3049 (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	0.3887	0.3811	0.3735	0.3354	0.3277	0.2896	0.2896	0.2820	0.3049	0.3277	0.3430	0.3582 (22b)
Effective ac	0.5755	0.5726	0.5697	0.5562	0.5537	0.5419	0.5419	0.5398	0.5465	0.5537	0.5588	0.5642 (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)			20.7700	1.1450	23.7824		(27)
Ground Floor			48.3300	0.1100	5.3163	140.0000	6766.2000 (28a)
Brick and Block	100.3900	22.8900	77.5000	0.2400	18.6000	42.2200	3272.0500 (29a)
Pitched Roof	48.3300		48.3300	0.1000	4.8330	9.0000	434.9700 (30)
Total net area of external elements Aum(A, m ²)			197.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8637		(33)
Party Wall 1			44.1900	0.0000	0.0000	110.0000	4860.9000 (32)
Ground Floor Block			52.6600			75.0000	3949.5000 (32c)
Ground Floor Stud			36.6800			9.0000	330.1200 (32c)
First Floor Stud			116.5700			9.0000	1049.1300 (32c)
Internal Floor 1			48.3300			18.0000	869.9400 (32d)
Internal Ceiling 1			48.3300			18.0000	869.9400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	22402.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							231.7686 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4197 (36)
Total fabric heat loss						(33) + (36) =	62.2834 (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	46.4476	46.2109	45.9788	44.8888	44.6849	43.7355	43.7355	43.5597	44.1012	44.6849	45.0975	45.5288 (38)
Heat transfer coeff	108.7310	108.4943	108.2622	107.1722	106.9683	106.0189	106.0189	105.8431	106.3846	106.9683	107.3808	107.8122 (39)
Average = Sum(39)m / 12 =												107.1712 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1249	1.1224	1.1200	1.1088	1.1066	1.0968	1.0968	1.0950	1.1006	1.1066	1.1109	1.1154 (40)
HLP (average)												1.1087 (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												2.7064 (42)
Average daily hot water use (litres/day)												98.4765 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.3242	104.3851	100.4461	96.5070	92.5679	88.6289	88.6289	92.5679	96.5070	100.4461	104.3851	108.3242 (44)
Energy conte	160.6416	140.4982	144.9816	126.3984	121.2823	104.6574	96.9805	111.2865	112.6156	131.2427	143.2616	155.5729 (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 = 1549.4194 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.0962	21.0747	21.7472	18.9598	18.1923	15.6986	14.5471	16.6930	16.8923	19.6864	21.4892	23.3359 (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	28.4522	25.6969	28.4459	27.5210	28.4328	27.5093	28.4223	28.4291	27.5157	28.4404	27.5295	28.4502 (61)
Total heat required for water heating calculated for each month	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230 (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												1.1705 (H8)
Utilisation factor												0.5744 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												98.4765 (H14)
Volume ratio Veff/V												0.7616 (H15)
Solar storage volume factor												0.9455 (H16)
Solar input												-866.1482 (H17)
Solar input	-25.1166	-41.9123	-71.3815	-95.6653	-118.1864	-116.1961	-114.6605	-100.1794	-78.4606	-53.5794	-29.7919	-21.0183 (63)
												Solar input (sum of months) = Sum (63)m = -866.1482 (63)
Output from w/h	163.9773	124.2828	102.0460	58.2541	31.5288	15.9707	10.7423	39.5362	61.6707	106.1038	140.9993	163.0047 (64)
												Total per year (kWh/year) = Sum (64)m = 1018.1167 (64)
Heat gains from water heating, kWh/month	60.5264	53.1399	55.3179	48.9077	47.4346	41.6759	39.3516	44.1101	44.3236	50.7483	54.5169	58.8405 (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	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.9749	49.7164	40.4321	30.6097	22.8811	19.3172	20.8729	27.1314	36.4157	46.2381	53.9667	57.5306	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	374.3468	378.2313	368.4424	347.6029	321.2968	296.5728	280.0556	276.1711	285.9600	306.7995	333.1056	357.8296	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	(71)
Water heating gains (Table 5)	81.3527	79.0772	74.3520	67.9274	63.7562	57.8832	52.8919	59.2877	61.5606	68.2101	75.7179	79.0867	(72)
Total internal gains	622.7467	618.0972	594.2987	557.2123	519.0064	484.8455	464.8927	473.6624	495.0086	532.3199	573.8624	605.5192	(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
East				7.4900	19.6403		0.6300		0.7000		0.7700		44.9574 (76)
South				9.1600	46.7521		0.6300		0.7000		0.7700		130.8784 (78)
West				4.1200	19.6403		0.6300		0.7000		0.7700		24.7296 (80)
Solar gains	200.5654	350.6676	497.5413	636.0170	722.8436	720.2422	693.4429	629.5690	546.3271	392.9494	242.0270	170.3982	(83)
Total gains	823.3120	968.7648	1091.8401	1193.2293	1241.8500	1205.0877	1158.3356	1103.2315	1041.3357	925.2693	815.8894	775.9174	(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	57.2328	57.3577	57.4807	58.0653	58.1760	58.6969	58.6969	58.7944	58.4952	58.1760	57.9525	57.7206
alpha	4.8155	4.8238	4.8320	4.8710	4.8784	4.9131	4.9131	4.9196	4.8997	4.8784	4.8635	4.8480
util living area	0.9878	0.9732	0.9401	0.8623	0.7269	0.5479	0.3999	0.4369	0.6620	0.8965	0.9753	0.9906 (86)
MIT	19.9612	20.1666	20.4365	20.7215	20.9043	20.9810	20.9967	20.9949	20.9534	20.7057	20.2760	19.9177 (87)
Th 2	19.9806	19.9826	19.9845	19.9937	19.9954	20.0034	20.0034	20.0049	20.0003	19.9954	19.9919	19.9883 (88)
util rest of house	0.9842	0.9658	0.9241	0.8282	0.6686	0.4688	0.3108	0.3446	0.5817	0.8623	0.9671	0.9878 (89)
MIT 2	19.0537	19.2562	19.5169	19.7851	19.9361	19.9952	20.0026	20.0035	19.9775	19.7800	19.3735	19.0170 (90)
Living area fraction	fLA = Living area / (4) =											0.1625 (91)
MIT	19.2012	19.4042	19.6664	19.9373	20.0934	20.1554	20.1642	20.1646	20.1361	19.9305	19.5202	19.1634 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2012	19.4042	19.6664	19.9373	20.0934	20.1554	20.1642	20.1646	20.1361	19.9305	19.5202	19.1634 (93)

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

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	3010.5163	0.2160	650.2715 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1140.5785	0.2160	246.3650 (264)
Space and water heating			896.6365 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	395.4137	0.5190	205.2197 (268)
Energy saving/generation technologies			
PV Unit	-1025.3477	0.5190	-532.1554 (269)
Total kg/year			634.5758 (272)
CO2 emissions per m2			6.5700 (273)
EI value			93.9974
EI rating			94 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.3300 (1b)	x 2.3900 (2b)	= 115.5087 (1b) - (3b)
First floor	48.3300 (1c)	x 2.6700 (2c)	= 129.0411 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 244.5498 (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) = 0.1227 (8)
Pressure test					Yes
Measured/design AP50					4.7200
Infiltration rate					0.3587 (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)	=	0.3049 (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	0.3201	0.2973	0.3049	0.2896	0.2896	0.2820	0.2744	0.2668	0.2591	0.2820	0.2668	0.2820 (22b)
Effective ac	0.5512	0.5442	0.5465	0.5419	0.5419	0.5398	0.5376	0.5356	0.5336	0.5398	0.5356	0.5398 (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)			20.7700	1.1450	23.7824		(27)
Ground Floor			48.3300	0.1100	5.3163	140.0000	6766.2000 (28a)
Brick and Block	100.3900	22.8900	77.5000	0.2400	18.6000	42.2200	3272.0500 (29a)
Pitched Roof	48.3300		48.3300	0.1000	4.8330	9.0000	434.9700 (30)
Total net area of external elements Aum(A, m ²)			197.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.8637		(33)
Party Wall 1			44.1900	0.0000	0.0000	110.0000	4860.9000 (32)
Ground Floor Block			52.6600			75.0000	3949.5000 (32c)
Ground Floor Stud			36.6800			9.0000	330.1200 (32c)
First Floor Stud			116.5700			9.0000	1049.1300 (32c)
Internal Floor 1			48.3300			18.0000	869.9400 (32d)
Internal Ceiling 1			48.3300			18.0000	869.9400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	22402.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							231.7686 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4197 (36)
Total fabric heat loss						(33) + (36) =	62.2834 (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	44.4856	43.9160	44.1012	43.7355	43.7355	43.5597	43.3886	43.2222	43.0605	43.5597	43.2222	43.5597 (38)
Heat transfer coeff	106.7690	106.1994	106.3846	106.0189	106.0189	105.8431	105.6720	105.5056	105.3439	105.8431	105.5056	105.8431 (39)
Average = Sum(39)m / 12 =												105.9123 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1046	1.0987	1.1006	1.0968	1.0968	1.0950	1.0932	1.0915	1.0898	1.0950	1.0915	1.0950 (40)
HLP (average)												1.0957 (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												2.7064 (42)
Average daily hot water use (litres/day)												98.4765 (43)
Daily hot water use	108.3242	104.3851	100.4461	96.5070	92.5679	88.6289	88.6289	92.5679	96.5070	100.4461	104.3851	108.3242 (44)
Energy conte	160.6416	140.4982	144.9816	126.3984	121.2823	104.6574	96.9805	111.2865	112.6156	131.2427	143.2616	155.5729 (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 =	1549.4194 (45)
Distribution loss (46)m = 0.15 x (45)m													
	24.0962	21.0747	21.7472	18.9598	18.1923	15.6986	14.5471	16.6930	16.8923	19.6864	21.4892	23.3359	(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	28.4522	25.6969	28.4459	27.5210	28.4328	27.5093	28.4223	28.4291	27.5157	28.4404	27.5295	28.4502	(61)
Total heat required for water heating calculated for each month													
	189.0938	166.1951	173.4275	153.9194	149.7152	132.1667	125.4028	139.7157	140.1313	159.6831	170.7911	184.0230	(62)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.7000	(H2)
Collector heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0050	(H3a)
Collector effective heat loss coefficient												1.8063	(H3b)
Collector performance ratio												2.5804	(H4)
Annual solar radiation per m2												1208.1510	(H5)
Overshading factor												0.8000	(H6)
Solar energy available												2029.6937	(H7)
Adjustment factor for showers												1.0000	(H7a)
Solar-to-load ratio												1.3100	(H8)
Utilisation factor												0.5339	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												75.0000	(H13)
Daily hot water demand												98.4765	(H14)
Volume ratio Veff/V												0.7616	(H15)
Solar storage volume factor												0.9455	(H16)
Solar input												-900.9679	(H17)
Solar input	-29.3918	-41.7932	-71.8325	-96.9186	-113.8368	-121.5956	-119.0385	-106.5430	-83.4158	-57.6709	-34.7627	-24.1686	(63)
												-900.9679	(63)
Output from w/h													
	159.7021	124.4019	101.5950	57.0008	35.8784	10.5711	6.3644	33.1726	56.7155	102.0123	136.0284	159.8545	(64)
												983.2970	(64)
Heat gains from water heating, kWh/month													
	60.5264	53.1399	55.3179	48.9077	47.4346	41.6759	39.3516	44.1101	44.3236	50.7483	54.5169	58.8405	(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	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	162.3828	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.9749	49.7164	40.4321	30.6097	22.8811	19.3172	20.8729	27.1314	36.4157	46.2381	53.9667	57.5306	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	374.3468	378.2313	368.4424	347.6029	321.2968	296.5728	280.0556	276.1711	285.9600	306.7995	333.1056	357.8296	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	53.9447	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	-108.2552	(71)
Water heating gains (Table 5)	81.3527	79.0772	74.3520	67.9274	63.7562	57.8832	52.8919	59.2877	61.5606	68.2101	75.7179	79.0867	(72)
Total internal gains	622.7467	618.0972	594.2987	557.2123	519.0064	484.8455	464.8927	473.6624	495.0086	532.3199	573.8624	605.5192	(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
East	7.4900	25.1925	0.6300		0.7000	0.7700	57.6668 (76)
South	9.1600	56.7559	0.6300		0.7000	0.7700	158.8832 (78)
West	4.1200	25.1925	0.6300		0.7000	0.7700	31.7206 (80)

Solar gains	248.2706	369.4252	529.0004	682.7123	740.3844	803.0230	766.3765	710.4746	614.1767	446.7342	298.6014	207.3657	(83)
Total gains	871.0172	987.5225	1123.2992	1239.9247	1259.3908	1287.8685	1231.2692	1184.1370	1109.1853	979.0541	872.4639	812.8850	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2846	58.5972	58.4952	58.6969	58.6969	58.7944	58.8896	58.9825	59.0731	58.7944	58.9825	58.7944	
alpha	4.8856	4.9065	4.8997	4.9131	4.9131	4.9196	4.9260	4.9322	4.9382	4.9196	4.9322	4.9196	
util living area	0.9819	0.9673	0.9239	0.8238	0.6699	0.4624	0.3337	0.3463	0.5784	0.8461	0.9592	0.9858	(86)
MIT	20.1015	20.2584	20.5299	20.7940	20.9402	20.9919	20.9987	20.9985	20.9769	20.8044	20.4314	20.0702	(87)
Th 2	19.9971	20.0019	20.0003	20.0034	20.0034	20.0049	20.0064	20.0078	20.0091	20.0049	20.0078	20.0049	(88)
util rest of house	0.9767	0.9584	0.9041	0.7833	0.6056	0.3845	0.2492	0.2588	0.4956	0.7997	0.9460	0.9816	(89)
MIT 2	19.2053	19.3616	19.6178	19.8552	19.9692	20.0019	20.0061	20.0075	19.9991	19.8717	19.5363	19.1813	(90)
Living area fraction												0.1625	(91)
MIT	19.3509	19.5073	19.7661	20.0078	20.1270	20.1628	20.1674	20.1685	20.1580	20.0233	19.6818	19.3258	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3509	19.5073	19.7661	20.0078	20.1270	20.1628	20.1674	20.1685	20.1580	20.0233	19.6818	19.3258	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9724	0.9530	0.8988	0.7835	0.6140	0.3970	0.2630	0.2731	0.5084	0.8006	0.9407	0.9778 (94)
Unutilised gains	846.9690	941.0896	1009.5655	971.5215	773.2110	511.2911	323.8080	323.3549	563.9545	783.8727	820.7502	794.8786 (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	1542.9141	1508.8102	1358.1141	1114.0242	808.6093	514.6973	324.1415	323.7475	574.9716	912.7150	1243.0475	1516.2889 (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	517.7831	381.5082	259.3201	102.6020	26.3363	0.0000	0.0000	0.0000	0.0000	95.8586	304.0540	536.7293 (98)
Space heating												2224.1917 (98)
Space heating per m2										(98) / (4) =		23.0105 (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 %)	90.2000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2465.8445	(211)

[illegible][illegible]

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)	395.4137 (232)

Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 1.20 * 1187 * 1.00) =	-1139.0766	-1139.0766	(233)
Total delivered energy for all uses		2949.6846	(238)

10a. Fuel costs - using BEDF prices (535)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2465.8445	7.6100	187.6508 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1102.5029	7.6100	83.9005 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Pump for solar water heating	50.0000	31.0800	15.5400 (249)
Energy for lighting	395.4137	31.0800	122.8946 (250)
Additional standing charges			105.0000 (251)

Energy saving/generation technologies			
PV Unit	-1139.0766	31.0800	-354.0250 (252)
Total energy cost			184.2708 (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	2465.8445	0.2160	532.6224 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1102.5029	0.2160	238.1406 (264)
Space and water heating			770.7630 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	395.4137	0.5190	205.2197 (268)

Energy saving/generation technologies			
PV Unit	-1139.0766	0.5190	-591.1807 (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

449.6770 (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	2465.8445	1.2200	3008.3303 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1102.5029	1.2200	1345.0535 (264)
Space and water heating			4353.3838 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	395.4137	3.0700	1213.9202 (268)
Energy saving/generation technologies			
PV Unit	-1139.0766	3.0700	-3496.9650 (269)
Primary energy kWh/year			2454.0890 (272)
Primary energy kWh/m2/year			25.3889 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 9	Issued on Date	30/01/2024
Assessment Reference	As Built	Prop Type Ref	Block A
Project	6 Wheatear Road, BOTLEY, SO32 2TX		
Calculation Type	New Build (As Built)		

SAP Rating	91 B	DER	10.22	TER	16.68
Environmental	92 A	% DER<TER	38.73		
CO ₂ Emissions (t/year)	0.64	DFEE	39.30	TFEE	49.19
General Requirements Compliance	Pass	% DFEE<TFEE	20.11		

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 9	Issued on Date	30/01/2024
Assessment Reference	As Built	Prop Type Ref	Block A
Project	6 Wheatear Road, BOTLEY, SO32 2TX		
Calculation Type	New Build (As Built)		

SAP Rating	91 B	DER	10.22	TER	16.68
Environmental	92 A	% DER<TER	38.73		
CO ₂ Emissions (t/year)	0.64	DFEE	39.30	TFEE	49.19
General Requirements Compliance	Pass	% DFEE<TFEE	20.11		

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 000004

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 9	Issued on Date	30/01/2024
Assessment Reference	As Built	Prop Type Ref	Block A
Project	6 Wheatear Road, BOTLEY, SO32 2TX		
Calculation Type	New Build (As Built)		

SAP Rating	91 B	DER	10.22	TER	16.68
Environmental	92 A	% DER<TER	38.73		
CO ₂ Emissions (t/year)	0.64	DFEE	39.30	TFEE	49.19
General Requirements Compliance	Pass	% DFEE<TFEE	20.11		

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

Floor 000005 - Floor - suspended beam-and-block floor

Floor Type: Suspended Floor

Area = 47.59 m², Perimeter = 20.95 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 9			Issued on Date	30/01/2024
Assessment Reference	As Built	Prop Type Ref	Block A		
Property	6 Wheatear Road, BOTLEY, SO32 2TX				
SAP Rating	91 B	DER	10.22	TER	16.68
Environmental	92 A	% DER<TER	38.73		
CO ₂ Emissions (t/year)	0.64	DFEE	39.30	TFEE	49.19
General Requirements Compliance	Pass	% DFEE<TFEE	20.11		
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	South
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:	19.84 m	48.33 m ²	2.39 m
	1st Storey:	19.84 m	48.33 m ²	2.67 m

7.0 Living Area	15.71	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	231.77	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	100.39	77.50

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	44.19

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Block	Dense block, plasterboard on dabs		75.00	52.66
Ground Floor Stud	Plasterboard on timber frame		9.00	36.68
First Floor Stud	Plasterboard on timber frame		9.00	116.57

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	48.33	48.33

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	48.33

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	48.33

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	48.33

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	South							2.12	
Front Elevation	Window	[1] Brick and Block	South	None	0.00					9.16	
East Elevation	Window	[1] Brick and Block	East	None	0.00					7.49	
West Elevation	Window	[1] Brick and Block	West	None	0.00					4.12	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.63	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	5.17	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.60	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	7.08	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	14.97	0.021	No	Knauf P5
Independently assessed	E4 Jamb	36.30	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	19.84	0.062	No	BE-E5-23902
Independently assessed	E6 Intermediate floor within a dwelling	19.84	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.89	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	11.09	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
Table K1 - Default	E25 Staggered party wall between dwellings	5.05	0.120	No	
Table K1 - Default	P1 Party wall - Ground floor	8.81	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.81	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.81	0.035	No	Knauf P29 Halved

Y-value 0.038 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Tested ? Yes
As Built AP₅₀ 4.72 m³/(h.m²) @ 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

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				3
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 14
Total number of L.E.L. fittings 14
Percentage of L.E.L. fittings 100.00 %

External

External lights fitted Yes
Light and motion sensor Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Database
Description Combi Boiler
Percentage of Heat 100 %
Database Ref. No. 18907
Fuel Type Mains gas
Main Heating BGW
SAP Code 104
In Winter 90.2
In Summer 87.6
Controls CBE Programmer, room thermostat and TRVs
PCDF Controls 0
Delayed Start Stat No
Sap Code 2106
Flue Type Balanced
Fan Assisted Flue Yes
Is MHS Pumped Pump in heated space
Heat Emitter Radiators
Flow Temperature Normal (> 45°C)
Combi boiler type Standard Combi

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Combi keep hot type	None			
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
1.20	South	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£62	A 92	