



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 3, Fieldfare Crescent
Botley, Southampton, SO32 2TW

Contact: Tobias Whiting
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Report Issue Date: 22/09/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 15			Issued on Date	22/09/2023
Assessment Reference	As Built	Prop Type Ref	Block C		
Property	3, Fieldfare Crescent , Botley, Southampton, SO32 2TW				
SAP Rating	88 B	DER	13.12	TER	18.13
Environmental	90 B	% DER<TER	27.63		
CO ₂ Emissions (t/year)	0.81	DFEE	41.64	TFEE	51.60
General Requirements Compliance	Pass	% DFEE<TFEE	19.31		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.13	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.12	kgCO ₂ /m ²	Pass
	-5.01 (-27.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.60	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	41.64	kWh/m ² /yr	
	-10.0 (-19.4%)	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	4.89 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

3.39 m², No overhang

Windows facing South

0.99 m², No overhang

Windows facing West

8.18 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

4.89 (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	0.034	W/m ² K
Photovoltaic array	0.94	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Environmental	90 B	TER	18.13
CO ₂ Emissions (t/year)	0.81	% DER<TER	27.63
General Requirements Compliance	Pass	DFEE	41.64
		TFEE	51.60
		% DFEE<TFEE	19.31
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.093	0.79	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	1.26	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	3.76	0.27	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	3.91	0.26	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	1.77	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	8.96	0.19	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	27.45	0.44	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.062	18.34	1.14	BE-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.34	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.70	0.58	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.79	0.39	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.10	0.39	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.10	0.36	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.78	1.40	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.78	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.78	0.31	Knauf P 29 Halved

Total: **6.02** W/mK:
Y-Value: **0.034** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Semi-Detached House, total floor area 84 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.13 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.12 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)41.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.89 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading: Average
Windows facing East: 3.39 m², No overhang
Windows facing South: 0.99 m², No overhang
Windows facing West: 8.18 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 0.034 W/m²K
Photovoltaic array 0.94 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2400 (1b)	x 2.3900 (2b)	= 100.9536 (1b) - (3b)
First floor	42.2400 (1c)	x 2.6700 (2c)	= 112.7808 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.7344 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1871 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.4316 (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)	=	0.3669 (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	0.4678	0.4586	0.4495	0.4036	0.3944	0.3486	0.3486	0.3394	0.3669	0.3944	0.4128	0.4311 (22b)
Effective ac	0.6094	0.6052	0.6010	0.5814	0.5778	0.5607	0.5607	0.5576	0.5673	0.5778	0.5852	0.5929 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26a)
Windows (Uw = 1.20)			12.5600	1.1450	14.3817		(27)
Ground Floor			42.2400	0.1100	4.6464	75.0000	3168.0000 (28a)
Brick and Block	92.8000	14.6800	78.1200	0.2400	18.7488	42.2200	3298.2264 (29a)
Pitched Roof	42.2400		42.2400	0.1000	4.2240	9.0000	380.1600 (30)
Total net area of external elements Aum(A, m ²)			177.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3329		(33)
Party Wall 1			44.4600	0.0000	0.0000	70.0000	3112.2000 (32)
Ground Floor Stud			64.8200			9.0000	583.3800 (32c)
First Floor Stud			91.1500			9.0000	820.3500 (32c)
Internal Floor 1			42.2400			18.0000	760.3200 (32d)
Internal Ceiling 1			42.2400			18.0000	760.3200 (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

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	42.9837	42.6840	42.3902	41.0105	40.7524	39.5507	39.5507	39.3282	40.0136	40.7524	41.2746	41.8206 (38)
Average = Sum(39)m / 12 =	93.3321	93.0324	92.7386	91.3589	91.1008	89.8991	89.8991	89.6766	90.3620	91.1008	91.6230	92.1689 (39)
												91.3577 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1048	1.1012	1.0978	1.0814	1.0784	1.0641	1.0641	1.0615	1.0696	1.0784	1.0846	1.0910 (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												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy content (annual)	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
										Total = Sum(45)m =		1488.1401 (45)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1432	20.2412	20.8871	18.2099	17.4728	15.0777	13.9717	16.0328	16.2243	18.9078	20.6393	22.4130 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5593	24.8900	27.5313	26.6135	27.4790	26.5677	27.4377	27.4645	26.5926	27.5097	26.6560	27.5512 (61)
Total heat required for water heating calculated for each month	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (64)
Heat gains from water heating, kWh/month	58.1907	51.0906	53.1826	47.0187	45.6012	40.0642	37.8301	42.4054	42.6119	48.7897	52.4146	56.5699 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1811.9927 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5789	19.1662	15.5870	11.8003	8.8209	7.4470	8.0467	10.4594	14.0386	17.8252	20.8047	22.1786 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.5486	230.9202	224.9438	212.2208	196.1602	181.0655	170.9813	168.6097	174.5861	187.3092	203.3698	218.4644 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957 (71)
Water heating gains (Table 5)	78.2133	76.0276	71.4820	65.3037	61.2920	55.6448	50.8469	56.9966	59.1832	65.5776	72.7980	76.0349 (72)
Total internal gains	392.4766	390.2499	376.1487	353.4607	330.4089	308.2931	294.0109	300.2016	311.9438	334.8479	361.1083	380.8138 (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	3.3900				19.6403		0.6300		0.7000		0.7700		20.3479 (76)	
South	0.9900				46.7521		0.6300		0.7000		0.7700		14.1452 (78)	
West	8.1800				19.6403		0.6300		0.7000		0.7700		49.0990 (80)	
Solar gains	83.5920	159.0189	253.2397	359.6492	434.6443	442.8048	422.4051	366.5049	291.0336	186.1876	103.3589	69.3324	(83)	
Total gains	476.0686	549.2688	629.3884	713.1099	765.0532	751.0980	716.4160	666.7065	602.9774	521.0355	464.4672	450.1462	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	38.3427	38.4662	38.5880	39.1708	39.2818	39.8068	39.8068	39.9056	39.6029	39.2818	39.0579	38.8265
alpha	3.5562	3.5644	3.5725	3.6114	3.6188	3.6538	3.6538	3.6604	3.6402	3.6188	3.6039	3.5884
util living area	0.9897	0.9821	0.9636	0.9160	0.8216	0.6708	0.5220	0.5732	0.7974	0.9448	0.9831	0.9915 (86)
MIT	19.2311	19.4396	19.7969	20.2598	20.6418	20.8824	20.9645	20.9500	20.7657	20.2544	19.6639	19.2007 (87)
Th 2	19.9969	19.9998	20.0027	20.0160	20.0185	20.0302	20.0302	20.0324	20.0257	20.0185	20.0135	20.0082 (88)
util rest of house	0.9875	0.9783	0.9555	0.8967	0.7798	0.5955	0.4189	0.4698	0.7357	0.9282	0.9788	0.9897 (89)
MIT 2	18.3786	18.5875	18.9420	19.4004	19.7544	19.9630	20.0167	20.0117	19.8749	19.4052	18.8220	18.3568 (90)
Living area fraction									fLA = Living area / (4) =			0.2140 (91)
MIT	18.5611	18.7699	19.1250	19.5843	19.9443	20.1597	20.2195	20.2125	20.0655	19.5870	19.0022	18.5374 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5611	18.7699	19.1250	19.5843	19.9443	20.1597	20.2195	20.2125	20.0655	19.5870	19.0022	18.5374 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	468.0965	533.9324	595.7287	632.2691	593.8370	455.3848	315.2004	326.7703	445.3304	478.8910	451.9159	443.8762 (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	1331.0152	1290.3470	1170.8222	976.1100	751.0596	499.8143	325.3923	341.8953	539.0586	818.7196	1090.5138	1321.4653 (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	642.0115	508.3106	427.8696	247.5654	116.9736	0.0000	0.0000	0.0000	0.0000	252.8325	459.7904	652.9263 (98)
Space heating												3308.2799 (98)
Space heating per m2												(98) / (4) = 39.1605 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.7000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3647.4972 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	642.0115	508.3106	427.8696	247.5654	116.9736	0.0000	0.0000	0.0000	0.0000	252.8325	459.7904	652.9263 (98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000 (210)
Space heating fuel (main heating system)	707.8407	560.4306	471.7415	272.9498	128.9676	0.0000	0.0000	0.0000	0.0000	278.7569	506.9354	719.8747 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (64)
Efficiency of water heater (217)m	90.0667	90.0141	89.8969	89.6317	89.1335	87.9000	87.9000	87.9000	87.9000	89.6213	89.9459	87.9000 (216)
Fuel for water heating, kWh/month	201.9032	177.5629	185.5225	165.1346	161.5157	144.5801	137.1816	152.8437	153.3041	171.3452	182.6117	196.4425 (219)
Water heating fuel used												2029.9477 (219)
Annual totals kWh/year												
Space heating fuel - main system												3647.4972 (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)												381.0894 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.94 * 908 * 1.00) =										-682.7064		-682.7064 (233)
Total delivered energy for all uses												5450.8279 (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	3647.4972	0.2160	787.8594 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2029.9477	0.2160	438.4687 (264)
Space and water heating			1226.3281 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	381.0894	0.5190	197.7854 (268)
Energy saving/generation technologies			
PV Unit	-682.7064	0.5190	-354.3246 (269)
Total CO2, kg/year			1108.7139 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1200 (273)

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

DER		13.1200 ZC1
Total Floor Area	TFA	84.4800
Assumed number of occupants	N	2.5424
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.0314 ZC2
CO2 emissions from cooking, equation (L16)		2.1309 ZC3
Total CO2 emissions		31.2823 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		31.2823 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2400 (1b)	x 2.3900 (2b)	= 100.9536 (1b) - (3b)
First floor	42.2400 (1c)	x 2.6700 (2c)	= 112.7808 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.7344 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1404 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3904 (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) =					0.3318 (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	0.4231	0.4148	0.4065	0.3650	0.3567	0.3152	0.3152	0.3069	0.3318	0.3567	0.3733	0.3899	(22b)				
Effective ac	0.5895	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5697	0.5760	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Semi-glazed door			2.1200	1.2000	2.5440			(26a)					
TER Opening Type (Uw = 1.40)			12.5600	1.3258	16.6515			(27)					
Ground Floor			42.2400	0.1300	5.4912			(28a)					
Brick and Block	92.8000	14.6800	78.1200	0.1800	14.0616			(29a)					
Pitched Roof	42.2400		42.2400	0.1300	5.4912			(30)					
Total net area of external elements Aum(A, m2)			177.2800					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		44.2395			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.7098 (36)					
Total fabric heat loss						(33) + (36) =		53.9493 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 41.5779	Feb 41.3328	Mar 41.0926	Apr 39.9642	May 39.7531	Jun 38.7703	Jul 38.7703	Aug 38.5883	Sep 39.1488	Oct 39.7531	Nov 40.1802	Dec 40.6267	(38)
Heat transfer coeff	95.5272	95.2821	95.0419	93.9135	93.7024	92.7196	92.7196	92.5376	93.0982	93.7024	94.1295	94.5760	(39)
Average = Sum(39)m / 12 =												93.9125	(39)
HLP	Jan 1.1308	Feb 1.1279	Mar 1.1250	Apr 1.1117	May 1.1092	Jun 1.0975	Jul 1.0975	Aug 1.0954	Sep 1.1020	Oct 1.1092	Nov 1.1142	Dec 1.1195	(40)
HLP (average)												1.1117	(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												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy conte	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
Energy content (annual)											Total = Sum(45)m =	1488.1401 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.1432	20.2412	20.8871	18.2099	17.4728	15.0777	13.9717	16.0328	16.2243	18.9078	20.6393	22.4130 (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	49.1618	45.7102	45.3060	41.9788	43.3781	45.3060	45.7102	49.1618	49.3151	50.9589 (61)
Solar input	205.2472	180.9689	188.4094	167.1096	161.7916	142.4970	136.5230	152.1911	153.8719	175.2138	186.9107	200.3789 (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	205.2472	180.9689	188.4094	167.1096	161.7916	142.4970	136.5230	152.1911	153.8719	175.2138	186.9107	200.3789 (64)
	64.0406	56.3749	58.5903	51.7929	50.0580	43.9170	41.8152	46.8658	47.3913	54.2028	58.0793	62.4219 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5789	19.1662	15.5870	11.8003	8.8209	7.4470	8.0467	10.4594	14.0386	17.8252	20.8047	22.1786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.5486	230.9202	224.9438	212.2208	196.1602	181.0655	170.9813	168.6097	174.5861	187.3092	203.3698	218.4644	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	(71)
Water heating gains (Table 5)	86.0761	83.8912	78.7504	71.9345	67.2822	60.9958	56.2032	62.9917	65.8213	72.8532	80.6657	83.9004	(72)
Total internal gains	400.3394	398.1135	383.4170	360.0915	336.3992	313.6442	299.3672	306.1967	318.5819	342.1235	368.9760	388.6793	(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					3.3900	19.6403	0.6300	0.7000				0.7700			20.3479 (76)
South					0.9900	46.7521	0.6300	0.7000				0.7700			14.1452 (78)
West					8.1800	19.6403	0.6300	0.7000				0.7700			49.0990 (80)
Solar gains	83.5920	159.0189	253.2397	359.6492	434.6443	442.8048	422.4051	366.5049	291.0336	186.1876	103.3589	69.3324			(83)
Total gains	483.9314	557.1324	636.6567	719.7407	771.0435	756.4490	721.7723	672.7016	609.6155	528.3110	472.3349	458.0117			(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	61.4135	61.5715	61.7272	62.4688	62.6096	63.2732	63.2732	63.3977	63.0159	62.6096	62.3255	62.0312	
alpha	5.0942	5.1048	5.1151	5.1646	5.1740	5.2182	5.2182	5.2265	5.2011	5.1740	5.1550	5.1354	
util living area	0.9984	0.9964	0.9895	0.9631	0.8847	0.7233	0.5523	0.6102	0.8599	0.9803	0.9966	0.9988	(86)
MIT	19.7593	19.9073	20.1645	20.5039	20.7880	20.9481	20.9896	20.9830	20.8674	20.4886	20.0627	19.7352	(87)
Th 2	19.9758	19.9781	19.9805	19.9913	19.9934	20.0028	20.0028	20.0046	19.9992	19.9934	19.9892	19.9849	(88)
util rest of house	0.9979	0.9951	0.9857	0.9490	0.8413	0.6340	0.4338	0.4894	0.7920	0.9702	0.9953	0.9984	(89)
MIT 2	18.3180	18.5358	18.9113	19.4033	19.7827	19.9678	19.9989	19.9974	19.8902	19.3903	18.7713	18.2893	(90)
Living area fraction	18.6265	18.8293	19.1795	19.6388	19.9978	20.1776	20.2109	20.2084	20.0993	19.6254	19.0476	18.5988	(92)
MIT	18.6265	18.8293	19.1795	19.6388	19.9978	20.1776	20.2109	20.2084	20.0993	19.6254	19.0476	18.5988	(93)
Temperature adjustment													
adjusted MIT	18.6265	18.8293	19.1795	19.6388	19.9978	20.1776	20.2109	20.2084	20.0993	19.6254	19.0476	18.5988	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	482.3607	553.2659	624.9359	678.4950	648.8462	492.3309	331.5175	346.5933	487.6416	509.9225	469.1903	456.8815	(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	1368.5677	1327.2155	1205.0863	1008.5228	777.5254	517.1494	334.8052	352.4166	558.5244	845.6990	1124.6255	1361.7761	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	659.3380	520.0941	431.6319	237.6200	95.7373	0.0000	0.0000	0.0000	0.0000	249.8177	471.9134	673.2415	(98)
Space heating												3339.3940	(98)
Space heating per m2												39.5288	(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												3575.3683 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	659.3380	520.0941	431.6319	237.6200	95.7373	0.0000	0.0000	0.0000	0.0000	249.8177	471.9134	673.2415 (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)	705.9293	556.8460	462.1326	254.4112	102.5025	0.0000	0.0000	0.0000	0.0000	267.4708	505.2606	720.8153 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	205.2472	180.9689	188.4094	167.1096	161.7916	142.4970	136.5230	152.1911	153.8719	175.2138	186.9107	200.3789 (64)
Efficiency of water heater (217)m	87.7790	87.5572	87.0721	85.9370	83.7797	80.3000	80.3000	80.3000	80.3000	85.9438	87.2853	80.3000 (216)
Fuel for water heating, kWh/month	233.8226	206.6865	216.3831	194.4559	193.1154	177.4558	170.0162	189.5282	191.6213	203.8703	214.1376	228.0527 (219)
Water heating fuel used												2419.1457 (219)
Annual totals kWh/year												
Space heating fuel - main system												3575.3683 (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)												381.0894 (232)
Total delivered energy for all uses												6450.6034 (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	3575.3683	0.2160	772.2795 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2419.1457	0.2160	522.5355 (264)
Space and water heating			1294.8150 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	381.0894	0.5190	197.7854 (268)
Total CO2, kg/m2/year			1531.5254 (272)
Emissions per m2 for space and water heating			15.3269 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3412 (272b)
Emissions per m2 for pumps and fans			0.4608 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3269 * 1.00) + 2.3412 + 0.4608, rounded to 2 d.p.			18.1300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2400 (1b)	x 2.3900 (2b)	= 100.9536 (1b) - (3b)
First floor	42.2400 (1c)	x 2.6700 (2c)	= 112.7808 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.7344 (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) = 0.1404 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.3849 (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)	=	0.3271 (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	0.4171	0.4089	0.4007	0.3598	0.3517	0.3108	0.3108	0.3026	0.3271	0.3517	0.3680	0.3844 (22b)
Effective ac	0.5870	0.5836	0.5803	0.5647	0.5618	0.5483	0.5483	0.5458	0.5535	0.5618	0.5677	0.5739 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26a)
Windows (Uw = 1.20)			12.5600	1.1450	14.3817		(27)
Ground Floor			42.2400	0.1100	4.6464	75.0000	3168.0000 (28a)
Brick and Block	92.8000	14.6800	78.1200	0.2400	18.7488	42.2200	3298.2264 (29a)
Pitched Roof	42.2400		42.2400	0.1000	4.2240	9.0000	380.1600 (30)
Total net area of external elements Aum(A, m ²)			177.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3329		(33)
Party Wall 1			44.4600	0.0000	0.0000	70.0000	3112.2000 (32)
Ground Floor Stud			64.8200			9.0000	583.3800 (32c)
First Floor Stud			91.1500			9.0000	820.3500 (32c)
Internal Floor 1			42.2400			18.0000	760.3200 (32d)
Internal Ceiling 1			42.2400			9.0000	380.1600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12502.7964 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 147.9971 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0155 (36)
Total fabric heat loss (33) + (36) = 50.3484 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.4013	41.1631	40.9296	39.8327	39.6275	38.6722	38.6722	38.4953	39.0402	39.6275	40.0427	40.4767 (38)
Heat transfer coeff	91.7497	91.5115	91.2779	90.1811	89.9759	89.0206	89.0206	88.8437	89.3886	89.9759	90.3911	90.8251 (39)
Average = Sum(39)m / 12 =												90.1801 (39)
HLP	1.0861	1.0832	1.0805	1.0675	1.0651	1.0537	1.0537	1.0517	1.0581	1.0651	1.0700	1.0751 (40)
HLP (average)												1.0675 (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												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
Daily hot water use	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy conte	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
Energy content (annual)										Total = Sum(45)m =		1488.1401 (45)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.7863	28.6751	29.5901	25.7974	24.7532	21.3601	19.7933	22.7131	22.9844	26.7861	29.2391	31.7517 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5789	19.1662	15.5870	11.8003	8.8209	7.4470	8.0467	10.4594	14.0386	17.8252	20.8047	22.1786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.5486	230.9202	224.9438	212.2208	196.1602	181.0655	170.9813	168.6097	174.5861	187.3092	203.3698	218.4644	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	(71)
Water heating gains (Table 5)	44.0676	42.6712	39.7717	35.8297	33.2704	29.6668	26.6039	30.5284	31.9227	36.0028	40.6098	42.6771	(72)
Total internal gains	355.3309	353.8935	341.4383	320.9867	299.3874	279.3152	266.7678	270.7334	281.6833	302.2731	325.9201	344.4560	(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					3.3900	19.6403	0.6300	0.7000			0.7700			20.3479 (76)
South					0.9900	46.7521	0.6300	0.7000			0.7700			14.1452 (78)
West					8.1800	19.6403	0.6300	0.7000			0.7700			49.0990 (80)
Solar gains	83.5920	159.0189	253.2397	359.6492	434.6443	442.8048	422.4051	366.5049	291.0336	186.1876	103.3589			69.3324 (83)
Total gains	438.9229	512.9124	594.6780	680.6359	734.0317	722.1200	689.1729	637.2383	572.7169	488.4606	429.2790			413.7884 (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	37.8530	37.9515	38.0486	38.5114	38.5992	39.0134	39.0134	39.0911	38.8528	38.5992	38.4219	38.2383	
alpha	3.5235	3.5301	3.5366	3.5674	3.5733	3.6009	3.6009	3.6061	3.5902	3.5733	3.5615	3.5492	
util living area	0.9913	0.9841	0.9666	0.9210	0.8294	0.6822	0.5337	0.5881	0.8102	0.9506	0.9855	0.9929	(86)
MIT	19.1681	19.3816	19.7480	20.2207	20.6172	20.8701	20.9598	20.9428	20.7429	20.2084	19.6024	19.1327	(87)
Th 2	20.0122	20.0146	20.0168	20.0275	20.0295	20.0388	20.0388	20.0405	20.0352	20.0295	20.0254	20.0212	(88)
util rest of house	0.9894	0.9808	0.9593	0.9030	0.7894	0.6082	0.4306	0.4849	0.7513	0.9359	0.9819	0.9914	(89)
MIT 2	18.3303	18.5439	18.9076	19.3748	19.7440	19.9630	20.0230	20.0162	19.8665	19.3724	18.7729	18.3017	(90)
Living area fraction	18.5096	18.7232	19.0874	19.5559	19.9308	20.1572	20.2235	20.2145	20.0541	19.5513	18.9505	0.2140	(91)
MIT	18.5096	18.7232	19.0874	19.5559	19.9308	20.1572	20.2235	20.2145	20.0541	19.5513	18.9505	18.4796	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5096	18.7232	19.0874	19.5559	19.9308	20.1572	20.2235	20.2145	20.0541	19.5513	18.9505	18.4796	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	432.5935	500.1006	565.2588	607.4885	576.0632	446.3006	311.0649	321.6776	431.0325	452.6297	419.2151	408.8750	(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	1303.7284	1264.9818	1148.9558	960.9587	740.5770	494.7015	322.5634	338.8929	532.2257	805.3991	1071.1753	1296.9412	(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	648.1244	514.0001	434.2705	254.4985	122.3982	0.0000	0.0000	0.0000	0.0000	262.4605	469.4114	660.7212	(98)
Space heating												3365.8849	(98)
Space heating per m2												39.8424	(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	836.7937	658.7525	675.2121	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8256	0.8854	0.8594	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	690.8612	583.2842	580.2797	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	939.7400	899.2815	840.3601	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	179.1927	235.1021	193.4998	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												607.7945 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	44.7982	58.7755	48.3750	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												151.9486 (107)
Space cooling per m2												1.7986 (108)
Energy for space heating												39.8424 (99)
Energy for space cooling												1.7986 (108)
Total												41.6410 (109)
Dwelling Fabric Energy Efficiency (DFEE)												41.6 (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	42.2400 (1b)	x 2.3900 (2b)	= 100.9536 (1b) - (3b)
First floor	42.2400 (1c)	x 2.6700 (2c)	= 112.7808 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.7344 (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) = 0.1404 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3904 (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) =				0.3318 (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	0.4231	0.4148	0.4065	0.3650	0.3567	0.3152	0.3152	0.3069	0.3318	0.3567	0.3733	0.3899 (22b)
Effective ac	0.5895	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5697	0.5760 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Semi-glazed door			2.1200	1.2000	2.5440		(26a)
TER Opening Type (Uw = 1.40)			12.5600	1.3258	16.6515		(27)
Ground Floor			42.2400	0.1300	5.4912		(28a)
Brick and Block	92.8000	14.6800	78.1200	0.1800	14.0616		(29a)
Pitched Roof	42.2400		42.2400	0.1300	5.4912		(30)
Total net area of external elements Aum(A, m ²)			177.2800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.2395		(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)							9.7098 (36)
Total fabric heat loss						(33) + (36) =	53.9493 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.5779	41.3328	41.0926	39.9642	39.7531	38.7703	38.7703	38.5883	39.1488	39.7531	40.1802	40.6267 (38)
Heat transfer coeff	95.5272	95.2821	95.0419	93.9135	93.7024	92.7196	92.7196	92.5376	93.0982	93.7024	94.1295	94.5760 (39)
Average = Sum(39)m / 12 =												93.9125 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1308	1.1279	1.1250	1.1117	1.1092	1.0975	1.0975	1.0954	1.1020	1.1092	1.1142	1.1195 (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												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy conte	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
Energy content (annual)										Total = Sum(45)m =		1488.1401 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.7863	28.6751	29.5901	25.7974	24.7532	21.3601	19.7933	22.7131	22.9844	26.7861	29.2391	31.7517 (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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	21.5789	19.1662	15.5870	11.8003	8.8209	7.4470	8.0467	10.4594	14.0386	17.8252	20.8047	22.1786 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	228.5486	230.9202	224.9438	212.2208	196.1602	181.0655	170.9813	168.6097	174.5861	187.3092	203.3698	218.4644 (68)
Pumps, fans	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120	35.7120 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957 (71)
Total internal gains	44.0676	42.6712	39.7717	35.8297	33.2704	29.6668	26.6039	30.5284	31.9227	36.0028	40.6098	42.6771 (72)
	355.3309	353.8935	341.4383	320.9867	299.3874	279.3152	266.7678	270.7334	281.6833	302.2731	325.9201	344.4560 (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			3.3900		19.6403		0.6300		0.7000		0.7700	20.3479 (76)
South			0.9900		46.7521		0.6300		0.7000		0.7700	14.1452 (78)
West			8.1800		19.6403		0.6300		0.7000		0.7700	49.0990 (80)

Solar gains	83.5920	159.0189	253.2397	359.6492	434.6443	442.8048	422.4051	366.5049	291.0336	186.1876	103.3589	69.3324 (83)
Total gains	438.9229	512.9124	594.6780	680.6359	734.0317	722.1200	689.1729	637.2383	572.7169	488.4606	429.2790	413.7884 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	61.4135	61.5715	61.7272	62.4688	62.6096	63.2732	63.2732	63.3977	63.0159	62.6096	62.3255	62.0312
util living area	5.0942	5.1048	5.1151	5.1646	5.1740	5.2182	5.2182	5.2265	5.2011	5.1740	5.1550	5.1354
	0.9990	0.9975	0.9922	0.9703	0.9007	0.7472	0.5757	0.6387	0.8828	0.9858	0.9978	0.9993 (86)
MIT	19.7094	19.8588	20.1199	20.4672	20.7644	20.9395	20.9874	20.9790	20.8466	20.4479	20.0152	19.6860 (87)
Th 2	19.9758	19.9781	19.9805	19.9913	19.9934	20.0028	20.0028	20.0046	19.9992	19.9934	19.9892	19.9849 (88)
util rest of house	0.9986	0.9966	0.9893	0.9585	0.8609	0.6586	0.4536	0.5148	0.8207	0.9783	0.9969	0.9990 (89)
MIT 2	18.7942	18.9451	19.2067	19.5556	19.8308	19.9744	19.9996	19.9984	19.9104	19.5427	19.1105	18.7782 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9901	19.1407	19.4021	19.7507	20.0306	20.1809	20.2110	20.2083	20.1107	19.7364	19.3041	18.9725 (92)
Temperature adjustment												
adjusted MIT	18.9901	19.1407	19.4021	19.7507	20.0306	20.1809	20.2110	20.2083	20.1107	19.7364	19.3041	18.9725 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9982	0.9957	0.9871	0.9549	0.8627	0.6758	0.4800	0.5416	0.8289	0.9757	0.9961	0.9986 (94)
Ext temp.	438.1129	510.6828	587.0274	649.9724	633.2208	487.9837	330.7837	345.1032	474.7000	476.5852	427.5932	413.2252 (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	1403.3028	1356.8806	1226.2420	1019.0242	780.5976	517.4618	334.8085	352.4113	559.5879	856.1068	1148.7688	1397.1195 (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	718.1012	568.6449	475.5756	265.7173	109.6484	0.0000	0.0000	0.0000	0.0000	282.3641	519.2464	732.0174 (98)
Space heating per m2	(98) / (4) =											3671.3153 (98)
												43.4578 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	871.5642	686.1250	703.2857	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8690	0.9290	0.9040	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	757.4248	637.4331	635.7790	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	939.7400	899.2815	840.3601	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	131.2669	194.8153	152.2083	0.0000	0.0000	0.0000	0.0000 (104)
												478.2905 (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 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.8167	48.7038	38.0521	0.0000	0.0000	0.0000 (107)
Space cooling											119.5726 (107)
Space cooling per m2											1.4154 (108)
Energy for space heating											43.4578 (99)
Energy for space cooling											1.4154 (108)
Total											44.8732 (109)
Target Fabric Energy Efficiency (TFEE)											51.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2400 (1b)	x 2.3900 (2b)	= 100.9536 (1b) - (3b)
First floor	42.2400 (1c)	x 2.6700 (2c)	= 112.7808 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.7344 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1871 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.4316 (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) =	0.3669 (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	0.3852	0.3577	0.3669	0.3486	0.3486	0.3394	0.3302	0.3210	0.3119	0.3394	0.3210	0.3394 (22b)
Effective ac	0.5742	0.5640	0.5673	0.5607	0.5607	0.5576	0.5545	0.5515	0.5486	0.5576	0.5515	0.5576 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26a)
Windows (Uw = 1.20)			12.5600	1.1450	14.3817		(27)
Ground Floor			42.2400	0.1100	4.6464	75.0000	3168.0000 (28a)
Brick and Block	92.8000	14.6800	78.1200	0.2400	18.7488	42.2200	3298.2264 (29a)
Pitched Roof	42.2400		42.2400	0.1000	4.2240	9.0000	380.1600 (30)
Total net area of external elements Aum(A, m ²)			177.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3329		(33)
Party Wall 1			44.4600	0.0000	0.0000	70.0000	3112.2000 (32)
Ground Floor Stud			64.8200			9.0000	583.3800 (32c)
First Floor Stud			91.1500			9.0000	820.3500 (32c)
Internal Floor 1			42.2400			18.0000	760.3200 (32d)
Internal Ceiling 1			42.2400			18.0000	760.3200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12882.9564 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 152.4971 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0155 (36)
Total fabric heat loss (33) + (36) = 50.3484 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.5002	39.7792	40.0136	39.5507	39.5507	39.3282	39.1116	38.9009	38.6962	39.3282	38.9009	39.3282 (38)
Heat transfer coeff	90.8486	90.1276	90.3620	89.8991	89.8991	89.6766	89.4600	89.2493	89.0446	89.6766	89.2493	89.6766 (39)
Average = Sum(39)m / 12 =												89.7641 (39)
HLP	1.0754	1.0669	1.0696	1.0641	1.0641	1.0615	1.0589	1.0565	1.0540	1.0615	1.0565	1.0615 (40)
HLP (average)												1.0625 (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												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
Daily hot water use	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy conte	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
Energy content (annual)										Total = Sum(45)m =		1488.1401 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1432	20.2412	20.8871	18.2099	17.4728	15.0777	13.9717	16.0328	16.2243	18.9078	20.6393	22.4130 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5593	24.8900	27.5313	26.6135	27.4790	26.5677	27.4377	27.4645	26.5926	27.5097	26.6560	27.5512 (61)
Total heat required for water heating calculated for each month	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (64)
RHI water heating demand												1811.9927 (64)
Heat gains from water heating, kWh/month	58.1907	51.0906	53.1826	47.0187	45.6012	40.0642	37.8301	42.4054	42.6119	48.7897	52.4146	56.5699 (65)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Total per year (kWh/year) = Sum(64)m =												1812 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.9472	47.9154	38.9674	29.5008	22.0522	18.6174	20.1168	26.1485	35.0965	44.5631	52.0117	55.4465	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.1173	344.6570	335.7370	316.7474	292.7764	270.2470	255.1960	251.6563	260.5763	279.5659	303.5369	326.0663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	(71)
Water heating gains (Table 5)	78.2133	76.0276	71.4820	65.3037	61.2920	55.6448	50.8469	56.9966	59.1832	65.5776	72.7980	76.0349	(72)
Total internal gains	579.9223	575.2446	552.8311	518.1965	482.7651	451.1538	432.8043	441.4460	461.5006	496.3512	534.9912	564.1923	(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	3.3900				25.1925		0.6300		0.7000		0.7700		26.1002 (76)	
South	0.9900				56.7559		0.6300		0.7000		0.7700		17.1719 (78)	
West	8.1800				25.1925		0.6300		0.7000		0.7700		62.9792 (80)	
Solar gains	106.2513	172.0790	275.9717	393.4813	451.2287	499.0782	472.4594	420.5609	334.7012	217.3341	130.9726	86.6085	83	
Total gains	686.1736	747.3236	828.8027	911.6778	933.9938	950.2320	905.2638	862.0069	796.2018	713.6853	665.9639	650.8008	84	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.3908	39.7059	39.6029	39.8068	39.8068	39.9056	40.0022	40.0967	40.1889	39.9056	40.0967	39.9056	
alpha	3.6261	3.6471	3.6402	3.6538	3.6538	3.6604	3.6668	3.6731	3.6793	3.6604	3.6731	3.6604	
util living area	0.9648	0.9515	0.9139	0.8315	0.7004	0.5107	0.3781	0.3951	0.6333	0.8523	0.9413	0.9690	(86)
MIT	19.6874	19.8433	20.1665	20.5465	20.8192	20.9575	20.9892	20.9876	20.9065	20.5843	20.1064	19.6766	(87)
Th 2	20.0210	20.0280	20.0257	20.0302	20.0302	20.0324	20.0345	20.0366	20.0386	20.0324	20.0366	20.0324	(88)
util rest of house	0.9579	0.9422	0.8973	0.7996	0.6455	0.4334	0.2878	0.3014	0.5574	0.8161	0.9281	0.9628	(89)
MIT 2	18.8464	19.0039	19.3142	19.6723	19.9085	20.0117	20.0312	20.0327	19.9865	19.7170	19.2701	18.8451	(90)
Living area fraction	19.0264	19.1835	19.4966	19.8594	20.1034	20.2141	20.2362	20.2371	20.1834	19.9026	19.4491	19.0231	(92)
MIT	19.0264	19.1835	19.4966	19.8594	20.1034	20.2141	20.2362	20.2371	20.1834	19.9026	19.4491	19.0231	(93)
Temperature adjustment													
adjusted MIT	19.0264	19.1835	19.4966	19.8594	20.1034	20.2141	20.2362	20.2371	20.1834	19.9026	19.4491	19.0231	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	651.2689	696.7795	734.9378	723.3274	607.0702	426.0826	277.9164	276.9292	453.4983	578.5166	611.5196	621.2590	(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	1283.3651	1251.2873	1129.2177	931.3035	683.5383	440.6793	280.5668	279.9839	488.2689	762.4847	1030.7485	1257.5412	(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	470.2796	372.6292	293.3442	149.7428	56.8922	0.0000	0.0000	0.0000	0.0000	136.8723	301.8449	473.3940	(98)
Space heating												2254.9992	(98)
RHI space heating demand												2255	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2400 (1b)	x 2.3900 (2b)	= 100.9536 (1b) - (3b)
First floor	42.2400 (1c)	x 2.6700 (2c)	= 112.7808 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.7344 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1871 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.4316 (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) =	0.3669 (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	0.4678	0.4586	0.4495	0.4036	0.3944	0.3486	0.3486	0.3394	0.3669	0.3944	0.4128	0.4311 (22b)
Effective ac	0.6094	0.6052	0.6010	0.5814	0.5778	0.5607	0.5607	0.5576	0.5673	0.5778	0.5852	0.5929 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26a)
Windows (Uw = 1.20)			12.5600	1.1450	14.3817		(27)
Ground Floor			42.2400	0.1100	4.6464	75.0000	3168.0000 (28a)
Brick and Block	92.8000	14.6800	78.1200	0.2400	18.7488	42.2200	3298.2264 (29a)
Pitched Roof	42.2400		42.2400	0.1000	4.2240	9.0000	380.1600 (30)
Total net area of external elements Aum(A, m ²)			177.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3329		(33)
Party Wall 1			44.4600	0.0000	0.0000	70.0000	3112.2000 (32)
Ground Floor Stud			64.8200			9.0000	583.3800 (32c)
First Floor Stud			91.1500			9.0000	820.3500 (32c)
Internal Floor 1			42.2400			18.0000	760.3200 (32d)
Internal Ceiling 1			42.2400			18.0000	760.3200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12882.9564 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 152.4971 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0155 (36)
Total fabric heat loss (33) + (36) = 50.3484 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.9837	42.6840	42.3902	41.0105	40.7524	39.5507	39.5507	39.3282	40.0136	40.7524	41.2746	41.8206 (38)
Heat transfer coeff	93.3321	93.0324	92.7386	91.3589	91.1008	89.8991	89.8991	89.6766	90.3620	91.1008	91.6230	92.1689 (39)
Average = Sum(39)m / 12 =												91.3577 (39)
HLP	1.1048	1.1012	1.0978	1.0814	1.0784	1.0641	1.0641	1.0615	1.0696	1.0784	1.0846	1.0910 (40)
HLP (average)												1.0814 (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) 2.5424 (42)
94.5818 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy conte	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
Energy content (annual)										Total = Sum(45)m =		1488.1401 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1432	20.2412	20.8871	18.2099	17.4728	15.0777	13.9717	16.0328	16.2243	18.9078	20.6393	22.4130 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5593	24.8900	27.5313	26.6135	27.4790	26.5677	27.4377	27.4645	26.5926	27.5097	26.6560	27.5512 (61)
Total heat required for water heating calculated for each month	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (64)
Heat gains from water heating, kWh/month	58.1907	51.0906	53.1826	47.0187	45.6012	40.0642	37.8301	42.4054	42.6119	48.7897	52.4146	56.5699 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1811.9927 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.9472	47.9154	38.9674	29.5008	22.0522	18.6174	20.1168	26.1485	35.0965	44.5631	52.0117	55.4465 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.1173	344.6570	335.7370	316.7474	292.7764	270.2470	255.1960	251.6563	260.5763	279.5659	303.5369	326.0663 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957 (71)
Water heating gains (Table 5)	78.2133	76.0276	71.4820	65.3037	61.2920	55.6448	50.8469	56.9966	59.1832	65.5776	72.7980	76.0349 (72)
Total internal gains	579.9223	575.2446	552.8311	518.1965	482.7651	451.1538	432.8043	441.4460	461.5006	496.3512	534.9912	564.1923 (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				3.3900	19.6403	0.6300	0.7000		0.7700		20.3479 (76)	
South				0.9900	46.7521	0.6300	0.7000		0.7700		14.1452 (78)	
West				8.1800	19.6403	0.6300	0.7000		0.7700		49.0990 (80)	
Solar gains	83.5920	159.0189	253.2397	359.6492	434.6443	442.8048	422.4051	366.5049	291.0336	186.1876	103.3589	69.3324 (83)
Total gains	663.5143	734.2635	806.0707	877.8458	917.4095	893.9586	855.2094	807.9509	752.5342	682.5388	638.3501	633.5247 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	38.3427	38.4662	38.5880	39.1708	39.2818	39.8068	39.8068	39.9056	39.6029	39.2818	39.0579	38.8265
alpha	3.5562	3.5644	3.5725	3.6114	3.6188	3.6538	3.6538	3.6604	3.6402	3.6188	3.6039	3.5884
util living area	0.9719	0.9582	0.9288	0.8632	0.7513	0.5910	0.4472	0.4883	0.7055	0.8906	0.9568	0.9757 (86)
MIT	19.5136	19.7069	20.0286	20.4309	20.7412	20.9227	20.9785	20.9703	20.8480	20.4437	19.9161	19.4812 (87)
Th 2	19.9969	19.9998	20.0027	20.0160	20.0185	20.0302	20.0302	20.0324	20.0257	20.0185	20.0135	20.0082 (88)
util rest of house	0.9664	0.9502	0.9148	0.8363	0.7033	0.5172	0.3550	0.3944	0.6366	0.8630	0.9471	0.9709 (89)
MIT 2	18.6569	18.8486	19.1637	19.5554	19.8341	19.9877	20.0223	20.0207	19.9332	19.5779	19.0672	18.6336 (90)
Living area fraction									fLA = Living area / (4)			0.2140 (91)
MIT	18.8402	19.0322	19.3488	19.7428	20.0282	20.1878	20.2270	20.2239	20.1289	19.7632	19.2489	18.8150 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8402	19.0322	19.3488	19.7428	20.0282	20.1878	20.2270	20.2239	20.1289	19.7632	19.2489	18.8150 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	635.8297	690.5558	728.5489	726.6640	645.7003	473.5854	320.0422	334.1887	485.0433	583.3240	598.5690	610.4044 (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	1357.0709	1314.7565	1191.5773	990.5821	758.7075	502.3393	326.0624	342.9184	544.7869	834.7763	1113.1175	1347.0513 (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	536.6034	419.4629	344.4932	190.0210	84.0774	0.0000	0.0000	0.0000	0.0000	187.0805	370.4749	548.0653 (98)
Space heating												2680.2786 (98)
Space heating per m2										(98) / (4) =		31.7268 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2955.1032 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	536.6034	419.4629	344.4932	190.0210	84.0774	0.0000	0.0000	0.0000	0.0000	187.0805	370.4749	548.0653	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	591.6245	462.4729	379.8161	209.5050	92.6983	0.0000	0.0000	0.0000	0.0000	206.2629	408.4619	604.2616	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712	(64)
Efficiency of water heater (217)m	89.9746	89.9098	89.7672	89.4523	88.9120	87.9000	87.9000	87.9000	87.9000	89.4160	89.8211	87.9000	(216)
Fuel for water heating, kWh/month	202.1100	177.7688	185.7904	165.4657	161.9181	144.5801	137.1816	152.8437	153.3041	171.7385	182.8653	196.6342	(219)
Water heating fuel used												2032.2006	(219)
Annual totals kWh/year													
Space heating fuel - main system												2955.1032	(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)												381.0894	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.94 * 908 * 1.00) =										-682.7064		-682.7064	(233)
Total delivered energy for all uses												4760.6868	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2955.1032	3.4800	102.8376 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2032.2006	3.4800	70.7206 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	381.0894	13.1900	50.2657 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-682.7064	13.1900	-90.0490 (252)
Total energy cost			263.6674 (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] =	0.8553 (257)
SAP value		88.0690
SAP rating (Section 12)		88 (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	2955.1032	0.2160	638.3023 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.2006	0.2160	438.9553 (264)
Space and water heating			1077.2576 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	381.0894	0.5190	197.7854 (268)
Energy saving/generation technologies			
PV Unit	-682.7064	0.5190	-354.3246 (269)
Total kg/year			959.6434 (272)
CO2 emissions per m2			11.3600 (273)
EI value			90.0686
EI rating			90 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8907 = 3.907$, stars = 4
Water heating environmental impact	$0.216 / 0.8907 = 0.2425$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2400 (1b)	x 2.3900 (2b)	= 100.9536 (1b) - (3b)
First floor	42.2400 (1c)	x 2.6700 (2c)	= 112.7808 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.7344 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1871 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.4316 (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) =	0.3669 (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	0.3852	0.3577	0.3669	0.3486	0.3486	0.3394	0.3302	0.3210	0.3119	0.3394	0.3210	0.3394 (22b)
Effective ac	0.5742	0.5640	0.5673	0.5607	0.5607	0.5576	0.5545	0.5515	0.5486	0.5576	0.5515	0.5576 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26a)
Windows (Uw = 1.20)			12.5600	1.1450	14.3817		(27)
Ground Floor			42.2400	0.1100	4.6464	75.0000	3168.0000 (28a)
Brick and Block	92.8000	14.6800	78.1200	0.2400	18.7488	42.2200	3298.2264 (29a)
Pitched Roof	42.2400		42.2400	0.1000	4.2240	9.0000	380.1600 (30)
Total net area of external elements Aum(A, m ²)			177.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3329		(33)
Party Wall 1			44.4600	0.0000	0.0000	70.0000	3112.2000 (32)
Ground Floor Stud			64.8200			9.0000	583.3800 (32c)
First Floor Stud			91.1500			9.0000	820.3500 (32c)
Internal Floor 1			42.2400			18.0000	760.3200 (32d)
Internal Ceiling 1			42.2400			18.0000	760.3200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12882.9564 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 152.4971 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0155 (36)
Total fabric heat loss (33) + (36) = 50.3484 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.5002	39.7792	40.0136	39.5507	39.5507	39.3282	39.1116	38.9009	38.6962	39.3282	38.9009	39.3282 (38)
Heat transfer coeff	90.8486	90.1276	90.3620	89.8991	89.8991	89.6766	89.4600	89.2493	89.0446	89.6766	89.2493	89.6766 (39)
Average = Sum(39)m / 12 =												89.7641 (39)
HLP	1.0754	1.0669	1.0696	1.0641	1.0641	1.0615	1.0589	1.0565	1.0540	1.0615	1.0565	1.0615 (40)
HLP (average)												1.0625 (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												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy conte	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
Energy content (annual)										Total = Sum(45)m =		1488.1401 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	23.1432	20.2412	20.8871	18.2099	17.4728	15.0777	13.9717	16.0328	16.2243	18.9078	20.6393	22.4130 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5593	24.8900	27.5313	26.6135	27.4790	26.5677	27.4377	27.4645	26.5926	27.5097	26.6560	27.5512 (61)
Total heat required for water heating calculated for each month	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (64)
Heat gains from water heating, kWh/month	58.1907	51.0906	53.1826	47.0187	45.6012	40.0642	37.8301	42.4054	42.6119	48.7897	52.4146	56.5699 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1811.9927 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.9472	47.9154	38.9674	29.5008	22.0522	18.6174	20.1168	26.1485	35.0965	44.5631	52.0117	55.4465 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.1173	344.6570	335.7370	316.7474	292.7764	270.2470	255.1960	251.6563	260.5763	279.5659	303.5369	326.0663 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957 (71)
Water heating gains (Table 5)	78.2133	76.0276	71.4820	65.3037	61.2920	55.6448	50.8469	56.9966	59.1832	65.5776	72.7980	76.0349 (72)
Total internal gains	579.9223	575.2446	552.8311	518.1965	482.7651	451.1538	432.8043	441.4460	461.5006	496.3512	534.9912	564.1923 (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					3.3900	25.1925	0.6300	0.7000	0.7700		26.1002 (76)	
South					0.9900	56.7559	0.6300	0.7000	0.7700		17.1719 (78)	
West					8.1800	25.1925	0.6300	0.7000	0.7700		62.9792 (80)	

Solar gains	106.2513	172.0790	275.9717	393.4813	451.2287	499.0782	472.4594	420.5609	334.7012	217.3341	130.9726	86.6085 (83)
Total gains	686.1736	747.3236	828.8027	911.6778	933.9938	950.2320	905.2638	862.0069	796.2018	713.6853	665.9639	650.8008 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.3908	39.7059	39.6029	39.8068	39.8068	39.9056	40.0022	40.0967	40.1889	39.9056	40.0967	39.9056
alpha	3.6261	3.6471	3.6402	3.6538	3.6538	3.6604	3.6668	3.6731	3.6793	3.6604	3.6731	3.6604
util living area	0.9648	0.9515	0.9139	0.8315	0.7004	0.5107	0.3781	0.3951	0.6333	0.8523	0.9413	0.9690 (86)
MIT	19.6874	19.8433	20.1665	20.5465	20.8192	20.9575	20.9892	20.9876	20.9065	20.5843	20.1064	19.6766 (87)
Th 2	20.0210	20.0280	20.0257	20.0302	20.0302	20.0324	20.0345	20.0366	20.0386	20.0324	20.0366	20.0324 (88)
util rest of house	0.9579	0.9422	0.8973	0.7996	0.6455	0.4334	0.2878	0.3014	0.5574	0.8161	0.9281	0.9628 (89)
MIT 2	18.8464	19.0039	19.3142	19.6723	19.9085	20.0117	20.0312	20.0327	19.9865	19.7170	19.2701	18.8451 (90)
Living area fraction									fLA = Living area / (4) =			0.2140 (91)
MIT	19.0264	19.1835	19.4966	19.8594	20.1034	20.2141	20.2362	20.2371	20.1834	19.9026	19.4491	19.0231 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0264	19.1835	19.4966	19.8594	20.1034	20.2141	20.2362	20.2371	20.1834	19.9026	19.4491	19.0231 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	651.2689	696.7795	734.9378	723.3274	607.0702	426.0826	277.9164	276.9292	453.4983	578.5166	611.5196	621.2590 (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	1283.3651	1251.2873	1129.2177	931.3035	683.5383	440.6793	280.5668	279.9839	488.2689	762.4847	1030.7485	1257.5412 (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	470.2796	372.6292	293.3442	149.7428	56.8922	0.0000	0.0000	0.0000	0.0000	136.8723	301.8449	473.3940 (98)
Space heating												2254.9992 (98)
Space heating per m2										(98) / (4) =		26.6927 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2486.2174 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	470.2796	372.6292	293.3442	149.7428	56.8922	0.0000	0.0000	0.0000	0.0000	136.8723	301.8449	473.3940	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	518.5001	410.8371	323.4225	165.0968	62.7257	0.0000	0.0000	0.0000	0.0000	150.9066	332.7948	521.9338	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712	(64)
Efficiency of water heater (217)m	89.9014	89.8410	89.6647	89.2862	88.6754	87.9000	87.9000	87.9000	87.9000	89.1977	89.6932	89.9206	(216)
Fuel for water heating, kWh/month	202.2744	177.9050	186.0028	165.7736	162.3501	144.5801	137.1816	152.8437	153.3041	172.1588	183.1262	196.8083	(219)
Water heating fuel used												2034.3089	(219)
Annual totals kWh/year													
Space heating fuel - main system												2486.2174	(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)												381.0894	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.94 * 1031 * 1.00) =										-775.3251		-775.3251	(233)
Total delivered energy for all uses												4201.2906	(238)

10a. Fuel costs - using BEDF prices (526)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2486.2174	10.2300	254.3400 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2034.3089	10.2300	208.1098 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	381.0894	36.7200	139.9360 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-775.3251	36.7200	-284.6994 (252)
Total energy cost			448.2265 (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	2486.2174	0.2160	537.0230 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2034.3089	0.2160	439.4107 (264)
Space and water heating			976.4337 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	381.0894	0.5190	197.7854 (268)
Energy saving/generation technologies			
PV Unit	-775.3251	0.5190	-402.3937 (269)
Total kg/year			810.7504 (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	2486.2174	1.2200	3033.1852 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2034.3089	1.2200	2481.8569 (264)
Space and water heating			5515.0421 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	381.0894	3.0700	1169.9446 (268)
Energy saving/generation technologies			
PV Unit	-775.3251	3.0700	-2380.2481 (269)
Primary energy kWh/year			4534.9886 (272)
Primary energy kWh/m2/year			53.6812 (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 88
Current environmental impact rating: B 90

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 84	-190 kg (23.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£84 2.25 kg/m²	B 89	A 92
Total Savings	£84 2.25 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 526 TEST (30 Aug 2023)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£167	£186	-£18
Mains gas	£565	£463	£102
Space heating	£385	£385	£0
Water heating	£208	£124	£84
Lighting	£140	£140	£0
Generated (PV)	-£285	-£285	£0
Total cost of fuels	£447	£364	£84
Total cost of uses	£448	£364	£84
Delivered energy	50 kWh/m²	38 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	7 kg/m²	2 kg/m²
Primary energy	54 kWh/m²	41 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2400 (1b)	x 2.3900 (2b)	= 100.9536 (1b) - (3b)
First floor	42.2400 (1c)	x 2.6700 (2c)	= 112.7808 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.7344 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1871 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.4316 (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) =	0.3669 (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	0.4678	0.4586	0.4495	0.4036	0.3944	0.3486	0.3486	0.3394	0.3669	0.3944	0.4128	0.4311 (22b)
Effective ac	0.6094	0.6052	0.6010	0.5814	0.5778	0.5607	0.5607	0.5576	0.5673	0.5778	0.5852	0.5929 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26a)
Windows (Uw = 1.20)			12.5600	1.1450	14.3817		(27)
Ground Floor			42.2400	0.1100	4.6464	75.0000	3168.0000 (28a)
Brick and Block	92.8000	14.6800	78.1200	0.2400	18.7488	42.2200	3298.2264 (29a)
Pitched Roof	42.2400		42.2400	0.1000	4.2240	9.0000	380.1600 (30)
Total net area of external elements Aum(A, m ²)			177.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3329		(33)
Party Wall 1			44.4600	0.0000	0.0000	70.0000	3112.2000 (32)
Ground Floor Stud			64.8200			9.0000	583.3800 (32c)
First Floor Stud			91.1500			9.0000	820.3500 (32c)
Internal Floor 1			42.2400			18.0000	760.3200 (32d)
Internal Ceiling 1			42.2400			18.0000	760.3200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12882.9564 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 152.4971 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0155 (36)
Total fabric heat loss (33) + (36) = 50.3484 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.9837	42.6840	42.3902	41.0105	40.7524	39.5507	39.5507	39.3282	40.0136	40.7524	41.2746	41.8206 (38)
Heat transfer coeff	93.3321	93.0324	92.7386	91.3589	91.1008	89.8991	89.8991	89.6766	90.3620	91.1008	91.6230	92.1689 (39)
Average = Sum(39)m / 12 =												91.3577 (39)
HLP	1.1048	1.1012	1.0978	1.0814	1.0784	1.0641	1.0641	1.0615	1.0696	1.0784	1.0846	1.0910 (40)
HLP (average)												1.0814 (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												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
Daily hot water use	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy conte	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
Energy content (annual)										Total = Sum(45)m =		1488.1401 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1432	20.2412	20.8871	18.2099	17.4728	15.0777	13.9717	16.0328	16.2243	18.9078	20.6393	22.4130 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5593	24.8900	27.5313	26.6135	27.4790	26.5677	27.4377	27.4645	26.5926	27.5097	26.6560	27.5512 (61)
Total heat required for water heating calculated for each month	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (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												1.2187 (H8)
Utilisation factor												0.5598 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.5818 (H14)
Volume ratio Veff/V												0.7930 (H15)
Solar storage volume factor												0.9536 (H16)
Solar input	-24.6860	-41.1939	-70.1579	-94.0254	-116.1605	-114.2043	-112.6950	-98.4622	-77.1156	-52.6609	-29.2812	-851.3009 (H17)
Solar input (sum of months) = Sum (63)m =												-851.3009 (63)
Output from w/h	157.1616	118.6377	96.6210	53.9875	27.8041	12.8816	7.8876	35.8875	57.6387	100.9008	134.9705	156.3132 (64)
Total per year (kWh/year) = Sum (64)m =												960.6918 (64)
Heat gains from water heating, kWh/month	58.1907	51.0906	53.1826	47.0187	45.6012	40.0642	37.8301	42.4054	42.6119	48.7897	52.4146	56.5699 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.9472	47.9154	38.9674	29.5008	22.0522	18.6174	20.1168	26.1485	35.0965	44.5631	52.0117	55.4465	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.1173	344.6570	335.7370	316.7474	292.7764	270.2470	255.1960	251.6563	260.5763	279.5659	303.5369	326.0663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	(71)
Water heating gains (Table 5)	78.2133	76.0276	71.4820	65.3037	61.2920	55.6448	50.8469	56.9966	59.1832	65.5776	72.7980	76.0349	(72)
Total internal gains	579.9223	575.2446	552.8311	518.1965	482.7651	451.1538	432.8043	441.4460	461.5006	496.3512	534.9912	564.1923	(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				3.3900	19.6403	0.6300		0.7000		0.7700		20.3479 (76)
South				0.9900	46.7521	0.6300		0.7000		0.7700		14.1452 (78)
West				8.1800	19.6403	0.6300		0.7000		0.7700		49.0990 (80)
Solar gains	83.5920	159.0189	253.2397	359.6492	434.6443	442.8048	422.4051	366.5049	291.0336	186.1876	103.3589	69.3324 (83)
Total gains	663.5143	734.2635	806.0707	877.8458	917.4095	893.9586	855.2094	807.9509	752.5342	682.5388	638.3501	633.5247 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.3427	38.4662	38.5880	39.1708	39.2818	39.8068	39.8068	39.9056	39.6029	39.2818	39.0579	38.8265	
alpha	3.5562	3.5644	3.5725	3.6114	3.6188	3.6538	3.6538	3.6604	3.6402	3.6188	3.6039	3.5884	
util living area	0.9719	0.9582	0.9288	0.8632	0.7513	0.5910	0.4472	0.4883	0.7055	0.8906	0.9568	0.9757	(86)
MIT	19.5136	19.7069	20.0286	20.4309	20.7412	20.9227	20.9785	20.9703	20.8480	20.4437	19.9161	19.4812	(87)
Th 2	19.9969	19.9998	20.0027	20.0160	20.0185	20.0302	20.0302	20.0324	20.0257	20.0185	20.0135	20.0082	(88)
util rest of house	0.9664	0.9502	0.9148	0.8363	0.7033	0.5172	0.3550	0.3944	0.6366	0.8630	0.9471	0.9709	(89)
MIT 2	18.6569	18.8486	19.1637	19.5554	19.8341	19.9877	20.0223	20.0207	19.9332	19.5779	19.0672	18.6336	(90)
Living area fraction													(91)
MIT	18.8402	19.0322	19.3488	19.7428	20.0282	20.1878	20.2270	20.2239	20.1289	19.7632	19.2489	18.8150	(92)
Temperature adjustment													(93)
adjusted MIT	18.8402	19.0322	19.3488	19.7428	20.0282	20.1878	20.2270	20.2239	20.1289	19.7632	19.2489	18.8150	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9583	0.9405	0.9038	0.8278	0.7038	0.5298	0.3742	0.4136	0.6445	0.8546	0.9377	0.9635	(94)
Useful gains	635.8297	690.5558	728.5489	726.6640	645.7003	473.5854	320.0422	334.1887	485.0433	583.3240	598.5690	610.4044	(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	1357.0709	1314.7565	1191.5773	990.5821	758.7075	502.3393	326.0624	342.9184	544.7869	834.7763	1113.1175	1347.0513	(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	536.6034	419.4629	344.4932	190.0210	84.0774	0.0000	0.0000	0.0000	0.0000	187.0805	370.4749	548.0653	(98)
Space heating												2680.2786	(98)
Space heating per m2												31.7268	(99)
											(98) / (4) =		

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2955.1032 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	536.6034	419.4629	344.4932	190.0210	84.0774	0.0000	0.0000	0.0000	0.0000	187.0805	370.4749	548.0653	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	591.6245	462.4729	379.8161	209.5050	92.6983	0.0000	0.0000	0.0000	0.0000	206.2629	408.4619	604.2616	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	157.1616	118.6377	96.6210	53.9875	27.8041	12.8816	7.8876	35.8875	57.6387	100.9008	134.9705	156.3132	(64)
Efficiency of water heater	90.0502	90.0674	90.0715	90.0652	89.9876	87.9000	87.9000	87.9000	87.9000	89.6989	89.9350	90.0633	(216)
(217)m													(217)
Fuel for water heating, kWh/month	174.5266	131.7209	107.2714	59.9426	30.8977	14.6549	8.9734	40.8276	65.5730	112.4884	150.0756	173.5592	(219)
Water heating fuel used												1070.5114	(219)
Annual totals kWh/year													
Space heating fuel - main system												2955.1032	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												381.0894	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.94 * 908 * 1.00) =										-682.7064		-682.7064	(233)
Total delivered energy for all uses												3848.9977	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2955.1032	3.4800	102.8376 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1070.5114	3.4800	37.2538 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	381.0894	13.1900	50.2657 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-682.7064	13.1900	-90.0490 (252)
Total energy cost			236.7956 (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] =	0.7681 (257)
SAP value			89.2849
SAP rating (Section 12)			89 (258)
SAP band			B

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	2955.1032	0.2160	638.3023 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1070.5114	0.2160	231.2305 (264)
Space and water heating			869.5328 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	381.0894	0.5190	197.7854 (268)
Energy saving/generation technologies			
PV Unit	-682.7064	0.5190	-354.3246 (269)
Total kg/year			777.8686 (272)
CO2 emissions per m2			9.2100 (273)
EI value			91.9498
EI rating			92 (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	42.2400 (1b)	x 2.3900 (2b)	= 100.9536 (1b) - (3b)
First floor	42.2400 (1c)	x 2.6700 (2c)	= 112.7808 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.7344 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1871 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.4316 (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) =		0.3669 (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	0.3852	0.3577	0.3669	0.3486	0.3486	0.3394	0.3302	0.3210	0.3119	0.3394	0.3210	0.3394 (22b)
Effective ac	0.5742	0.5640	0.5673	0.5607	0.5607	0.5576	0.5545	0.5515	0.5486	0.5576	0.5515	0.5576 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26a)
Windows (Uw = 1.20)			12.5600	1.1450	14.3817		(27)
Ground Floor			42.2400	0.1100	4.6464	75.0000	3168.0000 (28a)
Brick and Block	92.8000	14.6800	78.1200	0.2400	18.7488	42.2200	3298.2264 (29a)
Pitched Roof	42.2400		42.2400	0.1000	4.2240	9.0000	380.1600 (30)
Total net area of external elements Aum(A, m ²)			177.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3329		(33)
Party Wall 1			44.4600	0.0000	0.0000	70.0000	3112.2000 (32)
Ground Floor Stud			64.8200			9.0000	583.3800 (32c)
First Floor Stud			91.1500			9.0000	820.3500 (32c)
Internal Floor 1			42.2400			18.0000	760.3200 (32d)
Internal Ceiling 1			42.2400			18.0000	760.3200 (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) =	12882.9564 (34)
	152.4971 (35)
	6.0155 (36)
(33) + (36) =	50.3484 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 40.5002 Feb 39.7792 Mar 40.0136 Apr 39.5507 May 39.5507 Jun 39.3282 Jul 39.1116 Aug 38.9009 Sep 38.6962 Oct 39.3282 Nov 38.9009 Dec 39.3282 (38)
Heat transfer coeff	90.8486 90.1276 90.3620 89.8991 89.8991 89.6766 89.4600 89.2493 89.0446 89.6766 89.2493 89.6766 (39)
Average = Sum(39)m / 12 =	89.7641 (39)
HLP	Jan 1.0754 Feb 1.0669 Mar 1.0696 Apr 1.0641 May 1.0641 Jun 1.0615 Jul 1.0589 Aug 1.0565 Sep 1.0540 Oct 1.0615 Nov 1.0565 Dec 1.0615 (40)
HLP (average)	1.0625 (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												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy content	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
Energy content (annual)										Total = Sum(45)m =		1488.1401 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	23.1432	20.2412	20.8871	18.2099	17.4728	15.0777	13.9717	16.0328	16.2243	18.9078	20.6393	22.4130 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5593	24.8900	27.5313	26.6135	27.4790	26.5677	27.4377	27.4645	26.5926	27.5097	26.6560	27.5512 (61)
Total heat required for water heating calculated for each month	181.8476	159.8316	166.7789	148.0129	143.9646	127.0859	120.5826	134.3496	134.7543	153.5617	164.2517	176.9712 (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												1.3639 (H8)
Utilisation factor												0.5196 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.5818 (H14)
Volume ratio Veff/V												0.7930 (H15)
Solar storage volume factor												0.9536 (H16)
Solar input												-884.3440 (H17)
Solar input	-28.8494	-41.0221	-70.5071	-95.1304	-111.7363	-119.3521	-116.8421	-104.5772	-81.8767	-56.6068	-34.1213	-23.7226 (63)
Solar input (sum of months) = Sum (63)m =												-884.3440 (63)
Output from w/h	152.9982	118.8095	96.2718	52.8825	32.2283	7.7338	3.7406	29.7725	52.8776	96.9549	130.1304	153.2486 (64)
Total per year (kWh/year) = Sum (64)m =												927.6487 (64)
Heat gains from water heating, kWh/month	58.1907	51.0906	53.1826	47.0187	45.6012	40.0642	37.8301	42.4054	42.6119	48.7897	52.4146	56.5699 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	152.5435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.9472	47.9154	38.9674	29.5008	22.0522	18.6174	20.1168	26.1485	35.0965	44.5631	52.0117	55.4465	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.1173	344.6570	335.7370	316.7474	292.7764	270.2470	255.1960	251.6563	260.5763	279.5659	303.5369	326.0663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	52.7967	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	-101.6957	(71)
Water heating gains (Table 5)	78.2133	76.0276	71.4820	65.3037	61.2920	55.6448	50.8469	56.9966	59.1832	65.5776	72.7980	76.0349	(72)
Total internal gains	579.9223	575.2446	552.8311	518.1965	482.7651	451.1538	432.8043	441.4460	461.5006	496.3512	534.9912	564.1923	(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				3.3900	25.1925		0.6300	0.7000		0.7700	26.1002 (76)	
South				0.9900	56.7559		0.6300	0.7000		0.7700	17.1719 (78)	
West				8.1800	25.1925		0.6300	0.7000		0.7700	62.9792 (80)	
Solar gains	106.2513	172.0790	275.9717	393.4813	451.2287	499.0782	472.4594	420.5609	334.7012	217.3341	130.9726	86.6085 (83)
Total gains	686.1736	747.3236	828.8027	911.6778	933.9938	950.2320	905.2638	862.0069	796.2018	713.6853	665.9639	650.8008 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.3908	39.7059	39.6029	39.8068	39.8068	39.9056	40.0022	40.0967	40.1889	39.9056	40.0967	39.9056
alpha	3.6261	3.6471	3.6402	3.6538	3.6538	3.6604	3.6668	3.6731	3.6793	3.6604	3.6731	3.6604
util living area	0.9648	0.9515	0.9139	0.8315	0.7004	0.5107	0.3781	0.3951	0.6333	0.8523	0.9413	0.9690 (86)
MIT	19.6874	19.8433	20.1665	20.5465	20.8192	20.9575	20.9892	20.9876	20.9065	20.5843	20.1064	19.6766 (87)
Th 2	20.0210	20.0280	20.0257	20.0302	20.0302	20.0324	20.0345	20.0366	20.0386	20.0324	20.0366	20.0324 (88)
util rest of house	0.9579	0.9422	0.8973	0.7996	0.6455	0.4334	0.2878	0.3014	0.5574	0.8161	0.9281	0.9628 (89)
MIT 2	18.8464	19.0039	19.3142	19.6723	19.9085	20.0117	20.0312	20.0327	19.9865	19.7170	19.2701	18.8451 (90)
Living area fraction												0.2140 (91)
MIT	19.0264	19.1835	19.4966	19.8594	20.1034	20.2141	20.2362	20.2371	20.1834	19.9026	19.4491	19.0231 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0264	19.1835	19.4966	19.8594	20.1034	20.2141	20.2362	20.2371	20.1834	19.9026	19.4491	19.0231 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9491	0.9324	0.8867	0.7934	0.6500	0.4484	0.3070	0.3213	0.5696	0.8106	0.9182	0.9546	(94)
Useful gains	651.2689	696.7795	734.9378	723.3274	607.0702	426.0826	277.9164	276.9292	453.4983	578.5166	611.5196	621.2590	(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	1283.3651	1251.2873	1129.2177	931.3035	683.5383	440.6793	280.5668	279.9839	488.2689	762.4847	1030.7485	1257.5412	(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	470.2796	372.6292	293.3442	149.7428	56.8922	0.0000	0.0000	0.0000	0.0000	136.8723	301.8449	473.3940	(98)
Space heating												2254.9992	(98)
Space heating per m2											(98) / (4) =	26.6927	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2486.2174	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	470.2796	372.6292	293.3442	149.7428	56.8922	0.0000	0.0000	0.0000	0.0000	136.8723	301.8449	473.3940	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	518.5001	410.8371	323.4225	165.0968	62.7257	0.0000	0.0000	0.0000	0.0000	150.9066	332.7948	521.9338	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	152.9982	118.8095	96.2718	52.8825	32.2283	7.7338	3.7406	29.7725	52.8776	96.9549	130.1304	153.2486	(64)	
Efficiency of water heater	89.9963	90.0069	89.9917	89.9522	89.6671	87.9000	87.9000	87.9000	87.9000	89.5176	89.8379	89.9989	(217)	
Fuel for water heating, kWh/month	170.0050	132.0005	106.9786	58.7896	35.9421	8.7984	4.2555	33.8708	60.1566	108.3082	144.8502	170.2783	(219)	
Water heating fuel used												1034.2338	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2486.2174	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
central heating pump												30.0000	(230c)	
main heating flue fan												45.0000	(230e)	
pump for solar water heating												50.0000	(230g)	
Total electricity for the above, kWh/year												125.0000	(231)	
Electricity for lighting (calculated in Appendix L)												381.0894	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.94 * 1031 * 1.00) =										-775.3251		-775.3251	(233)	
Total delivered energy for all uses												3251.2155	(238)	

10a. Fuel costs - using BEDF prices (526)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2486.2174	10.2300	254.3400	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1034.2338	10.2300	105.8021	(247)
Pumps and fans for heating	75.0000	36.7200	27.5400	(249)
Pump for solar water heating	50.0000	36.7200	18.3600	(249)
Energy for lighting	381.0894	36.7200	139.9360	(250)
Additional standing charges			103.0000	(251)
Energy saving/generation technologies				
PV Unit	-775.3251	36.7200	-284.6994	(252)
Total energy cost			364.2788	(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	2486.2174	0.2160	537.0230	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1034.2338	0.2160	223.3945	(264)
Space and water heating			760.4175	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	381.0894	0.5190	197.7854	(268)
Energy saving/generation technologies				
PV Unit	-775.3251	0.5190	-402.3937	(269)
Total kg/year			620.6841	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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	2486.2174	1.2200	3033.1852 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1034.2338	1.2200	1261.7652 (264)
Space and water heating			4294.9504 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	381.0894	3.0700	1169.9446 (268)
Energy saving/generation technologies			
PV Unit	-775.3251	3.0700	-2380.2481 (269)
Primary energy kWh/year			3468.3969 (272)
Primary energy kWh/m2/year			41.0558 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 15	Issued on Date	22/09/2023
Assessment Reference	As Built	Prop Type Ref	Block C
Project	3, Fieldfare Crescent , Botley, Southampton, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.12	TER	18.13
Environmental	90 B	% DER<TER	27.63		
CO ₂ Emissions (t/year)	0.81	DFEE	41.64	TFEE	51.60
General Requirements Compliance	Pass	% DFEE<TFEE	19.31		

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 15	Issued on Date	22/09/2023
Assessment Reference	As Built	Prop Type Ref	Block C
Project	3, Fieldfare Crescent , Botley, Southampton, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.12	TER	18.13
Environmental	90 B	% DER<TER	27.63		
CO ₂ Emissions (t/year)	0.81	DFEE	41.64	TFEE	51.60
General Requirements Compliance	Pass	% DFEE<TFEE	19.31		

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

Wall 000003

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Supabloc						
	Main construction	100	0.1100	0.9091	94.04	460	1000
	Main construction	100	0.8803	0.1136	5.96	460	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.321 m ² K/W	Lower limit = 4.110 m ² K/W	Average = 4.215 m ² K/W
	Total correction = 0.0002 m ² K/W	U-value (unrounded) = 0.24 W/m ² K	

Unheated space: None

Total thickness: 330 mm

U-value: 0.24 W/m² K

Kappa: 42.22 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 15	Issued on Date	22/09/2023
Assessment Reference	As Built	Prop Type Ref	Block C
Property	3, Fieldfare Crescent , Botley, Southampton, SO32 2TW		
SAP Rating	88 B	DER	13.12
Environmental	90 B	TER	18.13
CO ₂ Emissions (t/year)	0.81	% DER<TER	27.63
General Requirements Compliance	Pass	DfEE	41.64
		TFEE	51.60
		% DfEE<TFEE	19.31
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2019
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	18.34 m	42.24 m ²	2.39 m
	1st Storey:	18.34 m	42.24 m ²	2.67 m

7.0 Living Area	18.08	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	152.5	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	92.80	78.12

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 both sides, dense cellular blocks, cavity		0.00	70.00	44.46

9.2 Internal Walls				Kappa (kJ/m ² K)	Area (m ²)
Description	Construction				
Ground Floor Stud	Plasterboard on timber frame			9.00	64.82
First Floor Stud	Plasterboard on timber frame			9.00	91.15

10.0 External Roofs				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
Pitched Roof	External Plane Roof	Plasterboard, insulated at ceiling level		0.10	9.00	42.24	42.24

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.24

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Suspended concrete floor, carpeted	0.11	75.00	42.24

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.24

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Elevation	Half Glazed Door	[1] Brick and Block	East							2.12	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					1.47	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					8.18	
Side Elevation	Window	[1] Brick and Block	South	None	0.00					0.99	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					1.92	

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)	0.79	0.093	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.26	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.76	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.91	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.77	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	8.96	0.021	No	Knauf P5
Independently assessed	E4 Jamb	27.45	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	18.34	0.062	No	BE-E5-23902
Independently assessed	E6 Intermediate floor within a dwelling	18.34	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.70	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.79	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	10.10	0.039	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	10.10	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	8.78	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.78	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.78	0.035	No	Knauf P 29 Halved

Y-value 0.034 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 4.89 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				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

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

External

External lights fitted Yes
Light and motion sensor Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Database
Description Combi Boiler
Percentage of Heat 100 %
Database Ref. No. 17515
Fuel Type Mains gas
Main Heating BGW
SAP Code 104
In Winter 90.7
In Summer 87.9
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	Gas/Oil, time clock			
25.0 Main Heating 2	None			
Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.94	West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£84	B 89	