



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 12 Fieldfare Crescent
BOTLEY, SO32 2TW

Contact: Tobias Whiting
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Report Issue Date: 07/03/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 38				Issued on Date	07/03/2024
Assessment Reference	As Build	Prop Type Ref	Block H			
Property	12 Fieldfare Crescent, BOTLEY, SO32 2TW					
SAP Rating	88 B	DER	13.79	TER	18.36	
Environmental	90 B	% DER<TER	24.88			
CO ₂ Emissions (t/year)	0.85	DFEE	42.78	TFEE	52.65	
General Requirements Compliance	Pass	% DFEE<TFEE	18.74			
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)	18.36	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.79	kgCO ₂ /m ²	Pass
	-4.57 (-24.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.65	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	42.78	kWh/m ² /yr	
	-9.8 (-18.6%)	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	4.81 (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 South East

3.53 m², No overhang

Windows facing South West

0.99 m², No overhang

Windows facing North 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

4.81 (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	0.76	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Environmental	90 B	% DER<TER	24.88		
CO ₂ Emissions (t/year)	0.85	DFEE	42.78	TFEE	52.65
General Requirements Compliance	Pass	% DFEE<TFEE	18.74		
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Client	Foreman Homes, FORE				

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.093	0.49	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	1.26	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	2.75	0.19	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.01	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	2.40	0.16	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	1.51	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	1.77	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	8.66	0.18	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	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	8.79	1.41	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.79	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.79	0.31	Knauf P29 Halved

Total: **5.99** 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) 18.36 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.79 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 42.8 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: 4.81 (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 South East: 3.53 m², No overhang
Windows facing South West: 0.99 m², No overhang
Windows facing North 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 0.76 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					4.8100
Infiltration rate					0.4276 (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) = 0.3635 (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	0.4635	0.4544	0.4453	0.3999	0.3908	0.3453	0.3453	0.3362	0.3635	0.3908	0.4089	0.4271 (22b)
Effective ac	0.6074	0.6032	0.5991	0.5799	0.5763	0.5596	0.5596	0.5565	0.5661	0.5763	0.5836	0.5912 (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)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.2400	0.1100	4.6464	140.0000	5913.6000 (28a)
Brick and Block	92.8000	14.8200	77.9800	0.2400	18.7152	42.2200	3292.3156 (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) =	44.4596		(33)
Party Wall 1			44.0900	0.0000	0.0000	110.0000	4849.9000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.3900			9.0000	822.5100 (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) = 17372.4056 (34)												
205.6393 (35)												
5.9850 (36)												
(33) + (36) = 50.4446 (37)												
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.8413	42.5471	42.2588	40.9046	40.6512	39.4717	39.4717	39.2532	39.9260	40.6512	41.1638	41.6996 (38)
Average = Sum(39)m / 12 =	93.2859	92.9918	92.7034	91.3492	91.0958	89.9163	89.9163	89.6979	90.3706	91.0958	91.6084	92.1443 (39)
												91.3480 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1042	1.1008	1.0973	1.0813	1.0783	1.0643	1.0643	1.0618	1.0697	1.0783	1.0844	1.0907 (40)
Days in month												1.0813 (40)
	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)												
	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

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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	21.5287	19.1216	15.5507	11.7729	8.8004	7.4296	8.0280	10.4351	14.0060	17.7838	20.7563	22.1270 (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	392.4264	390.2053	376.1125	353.4332	330.3884	308.2758	293.9921	300.1772	311.9112	334.8064	361.0599	380.7622 (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		
Southeast				3.5300	36.7938	0.6300	0.7000	0.7700		39.6937 (77)		
Southwest				0.9900	36.7938	0.6300	0.7000	0.7700		11.1322 (79)		
Northwest				8.1800	11.2829	0.6300	0.7000	0.7700		28.2064 (81)		
Solar gains	79.0323	143.9903	221.8996	316.6567	392.7551	406.6620	385.0962	325.7631	254.3104	165.8498	96.3687	66.5312 (83)
Total gains	471.4587	534.1956	598.0120	670.0900	723.1435	714.9378	679.0883	625.9403	566.2216	500.6562	457.4286	447.2934 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.7299	51.8935	52.0549	52.8266	52.9736	53.6685	53.6685	53.7992	53.3986	52.9736	52.6771	52.3708
alpha	4.4487	4.4596	4.4703	4.5218	4.5316	4.5779	4.5779	4.5866	4.5599	4.5316	4.5118	4.4914
util living area	0.9966	0.9935	0.9850	0.9563	0.8775	0.7221	0.5610	0.6224	0.8573	0.9730	0.9937	0.9973 (86)
MIT	19.5793	19.7371	20.0125	20.3905	20.7208	20.9220	20.9807	20.9696	20.8183	20.3957	19.9263	19.5570 (87)
Th 2	19.9974	20.0002	20.0030	20.0161	20.0186	20.0301	20.0301	20.0322	20.0256	20.0186	20.0136	20.0084 (88)
util rest of house	0.9956	0.9916	0.9804	0.9423	0.8378	0.6400	0.4474	0.5077	0.7965	0.9618	0.9915	0.9965 (89)
MIT 2	18.6982	18.8575	19.1328	19.5122	19.8191	19.9897	20.0240	20.0216	19.9145	19.5243	19.0571	18.6846 (90)
Living area fraction	18.8864	19.0454	19.3206	19.6997	20.0117	20.1888	20.2283	20.2241	20.1075	19.7104	19.2427	18.8709 (92)
MIT	18.8864	19.0454	19.3206	19.6997	20.0117	20.1888	20.2283	20.2241	20.1075	19.7104	19.2427	18.8709 (93)
Temperature adjustment												0.0000
adjusted MIT	18.8864	19.0454	19.3206	19.6997	20.0117	20.1888	20.2283	20.2241	20.1075	19.7104	19.2427	18.8709 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	468.6902	528.4504	583.8962	627.6919	605.6500	467.9580	320.2315	332.8313	454.3791	479.2392	452.5048	445.2053 (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	1360.7028	1315.4022	1188.5180	986.5468	757.1592	502.5204	326.2433	343.0091	542.9009	829.9153	1112.3719	1351.8387 (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	663.6573	528.8316	449.8386	258.3755	112.7228	0.0000	0.0000	0.0000	0.0000	260.9030	475.1043	674.5353 (98)
Space heating												3423.9685 (98)
Space heating per m2												(98) / (4) = 40.5299 (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												3775.0479 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	663.6573	528.8316	449.8386	258.3755	112.7228	0.0000	0.0000	0.0000	0.0000	260.9030	475.1043	674.5353 (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)	731.7060	583.0558	495.9632	284.8683	124.2810	0.0000	0.0000	0.0000	0.0000	287.6549	523.8195	743.6993 (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	90.0828	90.0344	89.9252	89.6598	89.1080	87.9000	87.9000	87.9000	87.9000	89.6420	89.9638	87.9000 (216)
Fuel for water heating, kWh/month	201.8671	177.5228	185.4640	165.0828	161.5619	144.5801	137.1816	152.8437	153.3041	171.3055	182.5753	196.4088 (219)
Water heating fuel used												2029.6979 (219)
Annual totals kWh/year												
Space heating fuel - main system												3775.0479 (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)												380.2032 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.76 * 1029 * 1.00) =										-625.7455		-625.7455 (233)
Total delivered energy for all uses												5634.2034 (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	3775.0479	0.2160	815.4104 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2029.6979	0.2160	438.4147 (264)
Space and water heating			1253.8251 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	380.2032	0.5190	197.3254 (268)
Energy saving/generation technologies			
PV Unit	-625.7455	0.5190	-324.7619 (269)
Total CO2, kg/year			1165.3136 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.7900 (273)

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

DER		13.7900 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		31.9523 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		31.9523 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 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)			12.7000	1.3258	16.8371		(27)
Ground Floor			42.2400	0.1300	5.4912		(28a)
Brick and Block	92.8000	14.8200	77.9800	0.1800	14.0364		(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) =	44.3999		(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)							9.6818 (36)
Total fabric heat loss						(33) + (36) =	54.0817 (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	95.6596	95.4146	95.1743	94.0459	93.8348	92.8520	92.8520	92.6700	93.2306	93.8348	94.2619	94.7084 (39)
Average = Sum(39)m / 12 =												94.0449 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1323	1.1294	1.1266	1.1132	1.1107	1.0991	1.0991	1.0969	1.1036	1.1107	1.1158	1.1211 (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	21.5287	19.1216	15.5507	11.7729	8.8004	7.4296	8.0280	10.4351	14.0060	17.7838	20.7563	22.1270	(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	400.2892	398.0689	383.3808	360.0640	336.3786	313.6269	299.3484	306.1724	318.5492	342.0820	368.9277	388.6277	(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
Southeast					3.5300	36.7938	0.6300	0.7000			0.7700			39.6937 (77)
Southwest					0.9900	36.7938	0.6300	0.7000			0.7700			11.1322 (79)
Northwest					8.1800	11.2829	0.6300	0.7000			0.7700			28.2064 (81)
Solar gains	79.0323	143.9903	221.8996	316.6567	392.7551	406.6620	385.0962	325.7631	254.3104	165.8498	96.3687	66.5312	(83)	
Total gains	479.3215	542.0592	605.2804	676.7208	729.1337	720.2889	684.4446	631.9354	572.8596	507.9318	465.2963	455.1588	(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	61.3285	61.4861	61.6413	62.3809	62.5212	63.1830	63.1830	63.3071	62.9264	62.5212	62.2379	61.9445	
alpha	5.0886	5.0991	5.1094	5.1587	5.1681	5.2122	5.2122	5.2205	5.1951	5.1681	5.1492	5.1296	
util living area	0.9985	0.9968	0.9916	0.9711	0.9030	0.7490	0.5799	0.6438	0.8830	0.9833	0.9969	0.9988	(86)
MIT	19.7521	19.8888	20.1294	20.4619	20.7601	20.9386	20.9869	20.9782	20.8459	20.4665	20.0532	19.7299	(87)
Th 2	19.9745	19.9769	19.9792	19.9900	19.9921	20.0016	20.0016	20.0033	19.9979	19.9921	19.9880	19.9837	(88)
util rest of house	0.9979	0.9957	0.9885	0.9595	0.8638	0.6605	0.4570	0.5193	0.8209	0.9746	0.9956	0.9984	(89)
MIT 2	18.3066	18.5079	18.8598	19.3447	19.7490	19.9591	19.9966	19.9939	19.8672	19.3586	18.7565	18.2807	(90)
Living area fraction	18.6153	18.8027	19.1309	19.5833	19.9649	20.1683	20.2080	20.2041	20.0762	19.5952	19.0334	18.5901	(91)
MIT	18.6153	18.8027	19.1309	19.5833	19.9649	20.1683	20.2080	20.2041	20.0762	19.5952	19.0334	18.5901	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6153	18.8027	19.1309	19.5833	19.9649	20.1683	20.2080	20.2041	20.0762	19.5952	19.0334	18.5901	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	477.8275	538.7025	596.1204	645.1943	628.9324	487.3265	330.8356	344.9179	473.5900	492.6074	462.3873	454.0649	(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	1369.3921	1326.5233	1202.1375	1004.7187	775.5336	517.0276	335.0142	352.5231	557.1649	844.0614	1124.8637	1362.8672	(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	663.3241	529.4156	450.8767	258.8576	109.0713	0.0000	0.0000	0.0000	0.0000	261.4818	476.9830	676.1489	(98)
Space heating												3426.1589	(98)
Space heating per m2												40.5559	(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												3668.2644 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	663.3241	529.4156	450.8767	258.8576	109.0713	0.0000	0.0000	0.0000	0.0000	261.4818	476.9830	676.1489 (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)	710.1971	566.8261	482.7374	277.1494	116.7787	0.0000	0.0000	0.0000	0.0000	279.9591	510.6884	723.9281 (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	87.7907	87.5934	87.1687	86.1491	84.0829	80.3000	80.3000	80.3000	80.3000	86.0571	87.3083	80.3000 (216)
Fuel for water heating, kWh/month	233.7915	206.6012	216.1433	193.9772	192.4192	177.4558	170.0162	189.5282	191.6213	203.6019	214.0813	228.0315 (219)
Water heating fuel used												2417.2687 (219)
Annual totals kWh/year												
Space heating fuel - main system												3668.2644 (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)												380.2032 (232)
Total delivered energy for all uses												6540.7362 (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	3668.2644	0.2160	792.3451 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2417.2687	0.2160	522.1300 (264)
Space and water heating			1314.4751 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	380.2032	0.5190	197.3254 (268)
Total CO2, kg/m2/year			1550.7256 (272)
Emissions per m2 for space and water heating			15.5596 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3358 (272b)
Emissions per m2 for pumps and fans			0.4608 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5596 * 1.00) + 2.3358 + 0.4608, rounded to 2 d.p.			18.3600 (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	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					4.8100
Infiltration rate					0.3809 (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) =				0.3237 (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	0.4128	0.4047	0.3966	0.3561	0.3480	0.3075	0.3075	0.2995	0.3237	0.3480	0.3642	0.3804 (22b)
Effective ac	0.5852	0.5819	0.5786	0.5634	0.5606	0.5473	0.5473	0.5448	0.5524	0.5606	0.5663	0.5723 (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)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.2400	0.1100	4.6464	140.0000	5913.6000 (28a)
Brick and Block	92.8000	14.8200	77.9800	0.2400	18.7152	42.2200	3292.3156 (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) =	44.4596		(33)
Party Wall 1			44.0900	0.0000	0.0000	110.0000	4849.9000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.3900			9.0000	822.5100 (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)
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) = 16992.2456 (34)
201.1393 (35)
5.9850 (36)
(33) + (36) = 50.4446 (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	41.2745	41.0411	40.8125	39.7383	39.5373	38.6018	38.6018	38.4285	38.9622	39.5373	39.9439	40.3689 (38)
Heat transfer coeff	91.7191	91.4858	91.2571	90.1829	89.9820	89.0464	89.0464	88.8732	89.4068	89.9820	90.3885	90.8136 (39)
Average = Sum(39)m / 12 =												90.1820 (39)
HLP	1.0857	1.0829	1.0802	1.0675	1.0651	1.0541	1.0541	1.0520	1.0583	1.0651	1.0699	1.0750 (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
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)

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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	21.5287	19.1216	15.5507	11.7729	8.8004	7.4296	8.0280	10.4351	14.0060	17.7838	20.7563	22.1270	(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	355.2807	353.8489	341.4021	320.9592	299.3669	279.2979	266.7491	270.7090	281.6507	302.2316	325.8718	344.4044	(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
Southeast				3.5300	36.7938		0.6300		0.7000		0.7700		39.6937 (77)
Southwest				0.9900	36.7938		0.6300		0.7000		0.7700		11.1322 (79)
Northwest				8.1800	11.2829		0.6300		0.7000		0.7700		28.2064 (81)
Solar gains	79.0323	143.9903	221.8996	316.6567	392.7551	406.6620	385.0962	325.7631	254.3104	165.8498	96.3687	66.5312	(83)
Total gains	434.3130	497.8392	563.3016	637.6160	692.1220	685.9599	651.8453	596.4721	535.9611	468.0814	422.2404	410.9356	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.4622	51.5935	51.7228	52.3388	52.4557	53.0068	53.0068	53.1102	52.7932	52.4557	52.2198	51.9754	
alpha	4.4308	4.4396	4.4482	4.4893	4.4970	4.5338	4.5338	4.5407	4.5195	4.4970	4.4813	4.4650	
util living area	0.9973	0.9946	0.9870	0.9607	0.8863	0.7362	0.5757	0.6411	0.8713	0.9773	0.9950	0.9979	(86)
MIT	19.5353	19.6955	19.9758	20.3592	20.7008	20.9129	20.9778	20.9645	20.7989	20.3593	19.8811	19.5091	(87)
Th 2	20.0125	20.0148	20.0170	20.0275	20.0294	20.0385	20.0385	20.0402	20.0350	20.0294	20.0255	20.0213	(88)
util rest of house	0.9966	0.9931	0.9831	0.9481	0.8491	0.6559	0.4615	0.5264	0.8147	0.9679	0.9933	0.9973	(89)
MIT 2	18.6681	18.8296	19.1096	19.4934	19.8127	19.9924	20.0313	20.0274	19.9090	19.4998	19.0235	18.6489	(90)
Living area fraction	18.8533	19.0145	19.2946	19.6783	20.0023	20.1889	20.2334	20.2275	20.0990	19.6833	19.2066	18.8325	(91)
MIT	18.8533	19.0145	19.2946	19.6783	20.0023	20.1889	20.2334	20.2275	20.0990	19.6833	19.2066	18.8325	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8533	19.0145	19.2946	19.6783	20.0023	20.1889	20.2334	20.2275	20.0990	19.6833	19.2066	18.8325	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9953	0.9910	0.9794	0.9425	0.8479	0.6695	0.4857	0.5503	0.8191	0.9635	0.9913	0.9963	(94)
Ext temp.	432.2839	493.3687	551.6904	600.9473	586.8328	459.2816	316.5958	328.2212	439.0183	450.9739	418.5860	409.4290	(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	1334.8146	1291.2767	1167.5985	972.0151	747.0597	497.6756	323.5450	340.1658	536.3513	817.3374	1094.3001	1328.8337	(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	671.4828	536.1942	458.2356	267.1688	119.2088	0.0000	0.0000	0.0000	0.0000	272.5745	486.5141	684.0372	(98)
Space heating per m2												3495.4160	(98)
												41.3757	(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	837.0363	658.9434	675.4360	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8466	0.9080	0.8784	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	708.6526	598.3057	593.3013	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	897.4518	855.6269	792.6790	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	135.9354	191.4470	148.3370	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												475.7194 (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	33.9838	47.8617	37.0842	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												118.9298 (107)
Space cooling per m2												1.4078 (108)
Energy for space heating												41.3757 (99)
Energy for space cooling												1.4078 (108)
Total												42.7834 (109)
Dwelling Fabric Energy Efficiency (DFEE)												42.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2400 (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					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)			12.7000	1.3258	16.8371		(27)
Ground Floor			42.2400	0.1300	5.4912		(28a)
Brick and Block	92.8000	14.8200	77.9800	0.1800	14.0364		(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) =	44.3999		(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)							9.6818 (36)
Total fabric heat loss						(33) + (36) =	54.0817 (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	95.6596	95.4146	95.1743	94.0459	93.8348	92.8520	92.8520	92.6700	93.2306	93.8348	94.2619	94.7084 (39)
Average = Sum(39)m / 12 =												94.0449 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1323	1.1294	1.1266	1.1132	1.1107	1.0991	1.0991	1.0969	1.1036	1.1107	1.1158	1.1211 (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	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	21.5287	19.1216	15.5507	11.7729	8.8004	7.4296	8.0280	10.4351	14.0060	17.7838	20.7563	22.1270 (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	355.2807	353.8489	341.4021	320.9592	299.3669	279.2979	266.7491	270.7090	281.6507	302.2316	325.8718	344.4044 (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
Southeast				3.5300	36.7938	0.6300	0.7000		0.7700			39.6937 (77)
Southwest				0.9900	36.7938	0.6300	0.7000		0.7700			11.1322 (79)
Northwest				8.1800	11.2829	0.6300	0.7000		0.7700			28.2064 (81)

Solar gains	79.0323	143.9903	221.8996	316.6567	392.7551	406.6620	385.0962	325.7631	254.3104	165.8498	96.3687	66.5312 (83)
Total gains	434.3130	497.8392	563.3016	637.6160	692.1220	685.9599	651.8453	596.4721	535.9611	468.0814	422.2404	410.9356 (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	61.3285	61.4861	61.6413	62.3809	62.5212	63.1830	63.1830	63.3071	62.9264	62.5212	62.2379	61.9445
util living area	5.0886	5.0991	5.1094	5.1587	5.1681	5.2122	5.2122	5.2205	5.1951	5.1681	5.1492	5.1296
	0.9990	0.9978	0.9939	0.9772	0.9179	0.7734	0.6051	0.6744	0.9046	0.9882	0.9980	0.9993 (86)
MIT	19.7022	19.8401	20.0843	20.4238	20.7342	20.9285	20.9841	20.9730	20.8223	20.4252	20.0057	19.6807 (87)
Th 2	19.9745	19.9769	19.9792	19.9900	19.9921	20.0016	20.0016	20.0033	19.9979	19.9921	19.9880	19.9837 (88)
util rest of house	0.9987	0.9971	0.9916	0.9677	0.8827	0.6863	0.4788	0.5476	0.8491	0.9818	0.9972	0.9990 (89)
MIT 2	18.7860	18.9255	19.1705	19.5134	19.8049	19.9671	19.9973	19.9951	19.8917	19.5199	19.1000	18.7719 (90)
Living area fraction									fLA = Living area / (4) =			0.2135 (91)
MIT	18.9816	19.1208	19.3656	19.7078	20.0034	20.1724	20.2081	20.2039	20.0904	19.7132	19.2934	18.9659 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9816	19.1208	19.3656	19.7078	20.0034	20.1724	20.2081	20.2039	20.0904	19.7132	19.2934	18.9659 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9982	0.9962	0.9897	0.9644	0.8832	0.7027	0.5060	0.5749	0.8553	0.9794	0.9963	0.9987 (94)
Ext temp.	433.5477	495.9376	557.4946	614.8923	611.2568	482.0308	329.8633	342.8897	458.4267	458.4389	420.6979	410.3928 (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	1404.4410	1356.8745	1224.4793	1016.4260	779.1442	517.4044	335.0157	352.5116	558.4876	855.1347	1149.3704	1398.4586 (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	722.3446	578.5496	496.2366	289.1042	124.9083	0.0000	0.0000	0.0000	0.0000	295.1417	524.6442	735.1210 (98)
Space heating per m2												3766.0502 (98)
										(98) / (4) =		44.5792 (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	872.8088	687.1048	704.2920	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8505	0.9156	0.8845	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	742.3019	629.1228	622.9307	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	897.4518	855.6269	792.6790	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	111.7079	168.5190	126.2927	0.0000	0.0000	0.0000	0.0000 (104)
												406.5197 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.9270	42.1298	31.5732	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												101.6299 (107)
Space cooling per m2												1.2030 (108)
Energy for space heating												44.5792 (99)
Energy for space cooling												1.2030 (108)
Total												45.7822 (109)
Target Fabric Energy Efficiency (TFEE)												52.6 (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					4.8100
Infiltration rate					0.4276 (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) =	0.3635 (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	0.3817	0.3544	0.3635	0.3453	0.3453	0.3362	0.3272	0.3181	0.3090	0.3362	0.3181	0.3362 (22b)
Effective ac	0.5728	0.5628	0.5661	0.5596	0.5596	0.5565	0.5535	0.5506	0.5477	0.5565	0.5506	0.5565 (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)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.2400	0.1100	4.6464	140.0000	5913.6000 (28a)
Brick and Block	92.8000	14.8200	77.9800	0.2400	18.7152	42.2200	3292.3156 (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) =	44.4596		(33)
Party Wall 1			44.0900	0.0000	0.0000	110.0000	4849.9000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.3900			9.0000	822.5100 (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) = 17372.4056 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 205.6393 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9850 (36)
Total fabric heat loss (33) + (36) = 50.4446 (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	40.4036	39.6959	39.9260	39.4717	39.4717	39.2532	39.0406	38.8339	38.6329	39.2532	38.8339	39.2532 (38)
Heat transfer coeff	90.8482	90.1405	90.3706	89.9163	89.9163	89.6979	89.4852	89.2785	89.0775	89.6979	89.2785	89.6979 (39)
Average = Sum(39)m / 12 =												89.7838 (39)
HLP	1.0754	1.0670	1.0697	1.0643	1.0643	1.0618	1.0592	1.0568	1.0544	1.0618	1.0568	1.0618 (40)
HLP (average)												1.0628 (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)

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	53.8217	47.8040	38.8768	29.4322	22.0009	18.5741	20.0700	26.0877	35.0149	44.4595	51.8907	55.3176 (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	579.7969	575.1332	552.7404	518.1279	482.7139	451.1105	432.7575	441.3852	461.4190	496.2476	534.8703	564.0633 (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	
Southeast				3.5300	45.1778	0.6300	0.7000		0.7700		48.7385 (77)	
Southwest				0.9900	45.1778	0.6300	0.7000		0.7700		13.6689 (79)	
Northwest				8.1800	14.6176	0.6300	0.7000		0.7700		36.5429 (81)	
Solar gains	98.9502	154.1808	241.2580	348.4258	411.5303	462.8802	434.9168	376.6640	292.8284	192.1217	120.4237	81.7820 (83)
Total gains	678.7471	729.3140	793.9985	866.5538	894.2441	913.9907	867.6743	818.0491	754.2474	688.3693	655.2939	645.8453 (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	53.1179	53.5349	53.3986	53.6685	53.6685	53.7992	53.9270	54.0519	54.1738	53.7992	54.0519	53.7992
alpha	4.5412	4.5690	4.5599	4.5779	4.5779	4.5866	4.5951	4.6035	4.6116	4.5866	4.6035	4.5866
util living area	0.9834	0.9760	0.9519	0.8849	0.7510	0.5415	0.3985	0.4208	0.6839	0.8993	0.9682	0.9857 (86)
MIT	19.9552	20.0741	20.3299	20.6481	20.8778	20.9785	20.9958	20.9948	20.9401	20.6811	20.2942	19.9477 (87)
Th 2	20.0210	20.0279	20.0256	20.0301	20.0301	20.0322	20.0343	20.0363	20.0382	20.0322	20.0363	20.0322 (88)
util rest of house	0.9790	0.9697	0.9391	0.8551	0.6919	0.4569	0.3017	0.3193	0.6004	0.8657	0.9585	0.9819 (89)
MIT 2	19.0892	19.2114	19.4581	19.7589	19.9532	20.0232	20.0333	20.0350	20.0084	19.7971	19.4355	19.0911 (90)
Living area fraction	19.2741	19.3956	19.6442	19.9488	20.1506	20.2272	20.2388	20.2400	20.2073	19.9859	19.6189	0.2135 (91)
MIT	19.2741	19.3956	19.6442	19.9488	20.1506	20.2272	20.2388	20.2400	20.2073	19.9859	19.6189	19.2740 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2741	19.3956	19.6442	19.9488	20.1506	20.2272	20.2388	20.2400	20.2073	19.9859	19.6189	19.2740 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9747	0.9647	0.9331	0.8522	0.6998	0.4745	0.3225	0.3411	0.6161	0.8638	0.9532	0.9780 (94)
Ext temp.	661.5949	703.5517	740.9184	738.4958	625.7601	433.6655	279.8082	278.9969	464.6669	594.6085	624.6541	631.6647 (95)
Heat loss rate W	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)
Month fracti	1305.8622	1270.5851	1142.6680	939.5173	687.9155	441.9567	280.8761	280.3317	490.5786	770.1352	1046.2427	1280.3473 (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	479.3348	381.0464	298.9017	144.7355	46.2436	0.0000	0.0000	0.0000	0.0000	130.5918	303.5438	482.6199 (98)
RHI space heating demand												2267.0176 (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					4.8100
Infiltration rate					0.4276 (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)	=	0.3635 (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	0.4635	0.4544	0.4453	0.3999	0.3908	0.3453	0.3453	0.3362	0.3635	0.3908	0.4089	0.4271 (22b)
Effective ac	0.6074	0.6032	0.5991	0.5799	0.5763	0.5596	0.5596	0.5565	0.5661	0.5763	0.5836	0.5912 (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)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.2400	0.1100	4.6464	140.0000	5913.6000 (28a)
Brick and Block	92.8000	14.8200	77.9800	0.2400	18.7152	42.2200	3292.3156 (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) =	44.4596		(33)
Party Wall 1			44.0900	0.0000	0.0000	110.0000	4849.9000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.3900			9.0000	822.5100 (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) = 17372.4056 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 205.6393 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9850 (36)
Total fabric heat loss (33) + (36) = 50.4446 (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	42.8413	42.5471	42.2588	40.9046	40.6512	39.4717	39.4717	39.2532	39.9260	40.6512	41.1638	41.6996 (38)
Heat transfer coeff	93.2859	92.9918	92.7034	91.3492	91.0958	89.9163	89.9163	89.6979	90.3706	91.0958	91.6084	92.1443 (39)
Average = Sum(39)m / 12 =												91.3480 (39)
HLP	1.1042	1.1008	1.0973	1.0813	1.0783	1.0643	1.0643	1.0618	1.0697	1.0783	1.0844	1.0907 (40)
HLP (average)												1.0813 (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 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	53.8217	47.8040	38.8768	29.4322	22.0009	18.5741	20.0700	26.0877	35.0149	44.4595	51.8907	55.3176	(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	579.7969	575.1332	552.7404	518.1279	482.7139	451.1105	432.7575	441.3852	461.4190	496.2476	534.8703	564.0633	(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	
Southeast				3.5300	36.7938		0.6300	0.7000	0.7700		39.6937 (77)	
Southwest				0.9900	36.7938		0.6300	0.7000	0.7700		11.1322 (79)	
Northwest				8.1800	11.2829		0.6300	0.7000	0.7700		28.2064 (81)	
Solar gains	79.0323	143.9903	221.8996	316.6567	392.7551	406.6620	385.0962	325.7631	254.3104	165.8498	96.3687	66.5312 (83)
Total gains	658.8292	719.1235	774.6400	834.7847	875.4690	857.7725	817.8537	767.1482	715.7294	662.0973	631.2390	630.5945 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.7299	51.8935	52.0549	52.8266	52.9736	53.6685	53.6685	53.7992	53.3986	52.9736	52.6771	52.3708	
alpha	4.4487	4.4596	4.4703	4.5218	4.5316	4.5779	4.5779	4.5866	4.5599	4.5316	4.5118	4.4914	
util living area	0.9873	0.9799	0.9621	0.9127	0.8055	0.6311	0.4746	0.5229	0.7595	0.9311	0.9783	0.9894	(86)
MIT	19.8152	19.9644	20.2168	20.5494	20.8136	20.9550	20.9901	20.9849	20.8948	20.5655	20.1400	19.7899	(87)
Th 2	19.9974	20.0002	20.0030	20.0161	20.0186	20.0301	20.0301	20.0322	20.0256	20.0186	20.0136	20.0084	(88)
util rest of house	0.9840	0.9747	0.9519	0.8890	0.7556	0.5498	0.3744	0.4198	0.6855	0.9074	0.9717	0.9867	(89)
MIT 2	18.9319	19.0812	19.3304	19.6575	19.8922	20.0081	20.0271	20.0273	19.9666	19.6808	19.2667	18.9157	(90)
Living area fraction									fLA = Living area / (4) =			0.2135	(91)
MIT	19.1205	19.2698	19.5196	19.8479	20.0889	20.2103	20.2328	20.2318	20.1648	19.8698	19.4532	19.1023	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1205	19.2698	19.5196	19.8479	20.0889	20.2103	20.2328	20.2318	20.1648	19.8698	19.4532	19.1023	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9803	0.9698	0.9459	0.8843	0.7595	0.5656	0.3958	0.4417	0.6971	0.9030	0.9669	0.9834	(94)
Ext temp.	645.8474	697.4332	732.7175	738.2175	664.9426	485.1711	323.6907	338.8748	498.9142	597.9038	610.3589	620.1016	(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	1382.5421	1336.2748	1206.9661	1000.0852	764.1954	504.4588	326.6454	343.7018	548.0813	844.4360	1131.6524	1373.1648	(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	548.1009	429.3016	352.8410	188.5448	73.8441	0.0000	0.0000	0.0000	0.0000	183.4200	375.3313	560.2790	(98)
Space heating per m2												2711.6627	(98)
												(98) / (4) =	32.0983 (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													2989.7052 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	548.1009	429.3016	352.8410	188.5448	73.8441	0.0000	0.0000	0.0000	0.0000	183.4200	375.3313	560.2790	(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)	604.3008	473.3203	389.0198	207.8773	81.4158	0.0000	0.0000	0.0000	0.0000	202.2271	413.8162	617.7277	(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	89.9859	89.9229	89.7821	89.4469	88.8297	87.9000	87.9000	87.9000	87.9000	89.4022	89.8290	87.9000	(216)
Fuel for water heating, kWh/month	202.0845	177.7429	185.7597	165.4757	162.0681	144.5801	137.1816	152.8437	153.3041	171.7649	182.8494	196.6090	(219)
Water heating fuel used												2032.2638	(219)
Annual totals kWh/year													
Space heating fuel - main system												2989.7052	(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)												380.2032	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 1029 * 1.00) =										-625.7455		-625.7455	(233)
Total delivered energy for all uses												4851.4267	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2989.7052	3.4800	104.0417 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2032.2638	3.4800	70.7228 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	380.2032	13.1900	50.1488 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-625.7455	13.1900	-82.5358 (252)
Total energy cost			272.2700 (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] =	0.8832 (257)
SAP value		87.6797
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	2989.7052	0.2160	645.7763 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.2638	0.2160	438.9690 (264)
Space and water heating			1084.7453 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	380.2032	0.5190	197.3254 (268)
Energy saving/generation technologies			
PV Unit	-625.7455	0.5190	-324.7619 (269)
Total kg/year			996.2338 (272)
CO2 emissions per m2			11.7900 (273)
EI value			89.6899
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					4.8100
Infiltration rate					0.4276 (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)	=	0.3635 (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	0.3817	0.3544	0.3635	0.3453	0.3453	0.3362	0.3272	0.3181	0.3090	0.3362	0.3181	0.3362 (22b)
Effective ac	0.5728	0.5628	0.5661	0.5596	0.5596	0.5565	0.5535	0.5506	0.5477	0.5565	0.5506	0.5565 (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)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.2400	0.1100	4.6464	140.0000	5913.6000 (28a)
Brick and Block	92.8000	14.8200	77.9800	0.2400	18.7152	42.2200	3292.3156 (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) =	44.4596		(33)
Party Wall 1			44.0900	0.0000	0.0000	110.0000	4849.9000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.3900			9.0000	822.5100 (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) = 17372.4056 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 205.6393 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9850 (36)
Total fabric heat loss (33) + (36) = 50.4446 (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	40.4036	39.6959	39.9260	39.4717	39.4717	39.2532	39.0406	38.8339	38.6329	39.2532	38.8339	39.2532 (38)
Heat transfer coeff	90.8482	90.1405	90.3706	89.9163	89.9163	89.6979	89.4852	89.2785	89.0775	89.6979	89.2785	89.6979 (39)
Average = Sum(39)m / 12 =												89.7838 (39)
HLP	1.0754	1.0670	1.0697	1.0643	1.0643	1.0618	1.0592	1.0568	1.0544	1.0618	1.0568	1.0618 (40)
HLP (average)												1.0628 (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 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	53.8217	47.8040	38.8768	29.4322	22.0009	18.5741	20.0700	26.0877	35.0149	44.4595	51.8907	55.3176 (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	579.7969	575.1332	552.7404	518.1279	482.7139	451.1105	432.7575	441.3852	461.4190	496.2476	534.8703	564.0633 (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	
Southeast				3.5300	45.1778	0.6300	0.7000		0.7700		48.7385 (77)	
Southwest				0.9900	45.1778	0.6300	0.7000		0.7700		13.6689 (79)	
Northwest				8.1800	14.6176	0.6300	0.7000		0.7700		36.5429 (81)	
Solar gains	98.9502	154.1808	241.2580	348.4258	411.5303	462.8802	434.9168	376.6640	292.8284	192.1217	120.4237	81.7820 (83)
Total gains	678.7471	729.3140	793.9985	866.5538	894.2441	913.9907	867.6743	818.0491	754.2474	688.3693	655.2939	645.8453 (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	53.1179	53.5349	53.3986	53.6685	53.6685	53.7992	53.9270	54.0519	54.1738	53.7992	54.0519	53.7992
alpha	4.5412	4.5690	4.5599	4.5779	4.5779	4.5866	4.5951	4.6035	4.6116	4.5866	4.6035	4.5866
util living area	0.9834	0.9760	0.9519	0.8849	0.7510	0.5415	0.3985	0.4208	0.6839	0.8993	0.9682	0.9857 (86)
MIT	19.9552	20.0741	20.3299	20.6481	20.8778	20.9785	20.9958	20.9948	20.9401	20.6811	20.2942	19.9477 (87)
Th 2	20.0210	20.0279	20.0256	20.0301	20.0301	20.0322	20.0343	20.0363	20.0382	20.0322	20.0363	20.0322 (88)
util rest of house	0.9790	0.9697	0.9391	0.8551	0.6919	0.4569	0.3017	0.3193	0.6004	0.8657	0.9585	0.9819 (89)
MIT 2	19.0892	19.2114	19.4581	19.7589	19.9532	20.0232	20.0333	20.0350	20.0084	19.7971	19.4355	19.0911 (90)
Living area fraction									fLA = Living area / (4) =			0.2135 (91)
MIT	19.2741	19.3956	19.6442	19.9488	20.1506	20.2272	20.2388	20.2400	20.2073	19.9859	19.6189	19.2740 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2741	19.3956	19.6442	19.9488	20.1506	20.2272	20.2388	20.2400	20.2073	19.9859	19.6189	19.2740 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	661.5949	703.5517	740.9184	738.4958	625.7601	433.6655	279.8082	278.9969	464.6669	594.6085	624.6541	631.6647 (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	1305.8622	1270.5851	1142.6680	939.5173	687.9155	441.9567	280.8761	280.3317	490.5786	770.1352	1046.2427	1280.3473 (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	479.3348	381.0464	298.9017	144.7355	46.2436	0.0000	0.0000	0.0000	0.0000	130.5918	303.5438	482.6199 (98)
Space heating												2267.0176 (98)
Space heating per m2										(98) / (4) =		26.8350 (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												2499.4681	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	479.3348	381.0464	298.9017	144.7355	46.2436	0.0000	0.0000	0.0000	0.0000	130.5918	303.5438	482.6199	(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)	528.4838	420.1173	329.5499	159.5760	50.9852	0.0000	0.0000	0.0000	0.0000	143.9822	334.6679	532.1057	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.8476	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	89.9123	89.8542	89.6769	89.2624	88.5647	87.9000	87.9000	87.9000	87.9000	89.1651	89.6968	87.9000	(216)
(217)m												89.9314	(217)
Fuel for water heating, kWh/month	202.2500	177.8788	185.9775	165.8178	162.5530	144.5801	137.1816	152.8437	153.3041	172.2219	183.1188	196.7847	(219)
Water heating fuel used												2034.5120	(219)
Annual totals kWh/year													
Space heating fuel - main system												2499.4681	(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)												380.2032	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.76 * 1156 * 1.00) =										-702.9883		-702.9883	(233)
Total delivered energy for all uses												4286.1951	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2499.4681	7.6100	190.2095 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2034.5120	7.6100	154.8264 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	380.2032	31.0800	118.1671 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-702.9883	31.0800	-218.4887 (252)
Total energy cost			373.0243 (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	2499.4681	0.2160	539.8851 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2034.5120	0.2160	439.4546 (264)
Space and water heating			979.3397 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	380.2032	0.5190	197.3254 (268)
Energy saving/generation technologies			
PV Unit	-702.9883	0.5190	-364.8509 (269)
Total kg/year			850.7392 (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	2499.4681	1.2200	3049.3511 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2034.5120	1.2200	2482.1047 (264)
Space and water heating			5531.4558 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	380.2032	3.0700	1167.2237 (268)
Energy saving/generation technologies			
PV Unit	-702.9883	3.0700	-2158.1739 (269)
Primary energy kWh/year			4770.7556 (272)
Primary energy kWh/m2/year			56.4720 (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	-£ 61	-190 kg (22.3%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£61 2.25 kg/m²	B 89	A 92
Total Savings	£61 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 538 TEST (29 Feb 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£141	£157	-£16
Mains gas	£450	£374	£76
Space heating	£319	£319	£0
Water heating	£155	£94	£61
Lighting	£118	£118	£0
Generated (PV)	-£218	-£218	£0
Total cost of fuels	£373	£313	£60
Total cost of uses	£374	£313	£61
Delivered energy	51 kWh/m²	39 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	8 kg/m²	2 kg/m²
Primary energy	56 kWh/m²	44 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					4.8100
Infiltration rate					0.4276 (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) =	0.3635 (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	0.4635	0.4544	0.4453	0.3999	0.3908	0.3453	0.3453	0.3362	0.3635	0.3908	0.4089	0.4271 (22b)
Effective ac	0.6074	0.6032	0.5991	0.5799	0.5763	0.5596	0.5596	0.5565	0.5661	0.5763	0.5836	0.5912 (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)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.2400	0.1100	4.6464	140.0000	5913.6000 (28a)
Brick and Block	92.8000	14.8200	77.9800	0.2400	18.7152	42.2200	3292.3156 (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) =	44.4596		(33)
Party Wall 1			44.0900	0.0000	0.0000	110.0000	4849.9000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.3900			9.0000	822.5100 (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) = 17372.4056 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 205.6393 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9850 (36)
Total fabric heat loss (33) + (36) = 50.4446 (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	42.8413	42.5471	42.2588	40.9046	40.6512	39.4717	39.4717	39.2532	39.9260	40.6512	41.1638	41.6996 (38)
Heat transfer coeff	93.2859	92.9918	92.7034	91.3492	91.0958	89.9163	89.9163	89.6979	90.3706	91.0958	91.6084	92.1443 (39)
Average = Sum(39)m / 12 =												91.3480 (39)
HLP	1.1042	1.1008	1.0973	1.0813	1.0783	1.0643	1.0643	1.0618	1.0697	1.0783	1.0844	1.0907 (40)
HLP (average)												1.0813 (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	53.8217	47.8040	38.8768	29.4322	22.0009	18.5741	20.0700	26.0877	35.0149	44.4595	51.8907	55.3176	(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	579.7969	575.1332	552.7404	518.1279	482.7139	451.1105	432.7575	441.3852	461.4190	496.2476	534.8703	564.0633	(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
Southeast				3.5300	36.7938		0.6300	0.7000		0.7700		39.6937 (77)
Southwest				0.9900	36.7938		0.6300	0.7000		0.7700		11.1322 (79)
Northwest				8.1800	11.2829		0.6300	0.7000		0.7700		28.2064 (81)
Solar gains	79.0323	143.9903	221.8996	316.6567	392.7551	406.6620	385.0962	325.7631	254.3104	165.8498	96.3687	66.5312 (83)
Total gains	658.8292	719.1235	774.6400	834.7847	875.4690	857.7725	817.8537	767.1482	715.7294	662.0973	631.2390	630.5945 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.7299	51.8935	52.0549	52.8266	52.9736	53.6685	53.6685	53.7992	53.3986	52.9736	52.6771	52.3708	
alpha	4.4487	4.4596	4.4703	4.5218	4.5316	4.5779	4.5779	4.5866	4.5599	4.5316	4.5118	4.4914	
util living area	0.9873	0.9799	0.9621	0.9127	0.8055	0.6311	0.4746	0.5229	0.7595	0.9311	0.9783	0.9894 (86)	
MIT	19.8152	19.9644	20.2168	20.5494	20.8136	20.9550	20.9901	20.9849	20.8948	20.5655	20.1400	19.7899 (87)	
Th 2	19.9974	20.0002	20.0030	20.0161	20.0186	20.0301	20.0301	20.0322	20.0256	20.0186	20.0136	20.0084 (88)	
util rest of house	0.9840	0.9747	0.9519	0.8890	0.7556	0.5498	0.3744	0.4198	0.6855	0.9074	0.9717	0.9867 (89)	
MIT 2	18.9319	19.0812	19.3304	19.6575	19.8922	20.0081	20.0271	20.0273	19.9666	19.6808	19.2667	18.9157 (90)	
Living area fraction													0.2135 (91)
MIT	19.1205	19.2698	19.5196	19.8479	20.0889	20.2103	20.2328	20.2318	20.1648	19.8698	19.4532	19.1023 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.1205	19.2698	19.5196	19.8479	20.0889	20.2103	20.2328	20.2318	20.1648	19.8698	19.4532	19.1023 (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	0.9803	0.9698	0.9459	0.8843	0.7595	0.5656	0.3958	0.4417	0.6971	0.9030	0.9669	0.9834	(94)
Useful gains	645.8474	697.4332	732.7175	738.2175	664.9426	485.1711	323.6907	338.8748	498.9142	597.9038	610.3589	620.1016	(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	1382.5421	1336.2748	1206.9661	1000.0852	764.1954	504.4588	326.6454	343.7018	548.0813	844.4360	1131.6524	1373.1648	(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	548.1009	429.3016	352.8410	188.5448	73.8441	0.0000	0.0000	0.0000	0.0000	183.4200	375.3313	560.2790	(98)
Space heating												2711.6627	(98)
Space heating per m2											(98) / (4) =	32.0983	(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													2989.7052	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	548.1009	429.3016	352.8410	188.5448	73.8441	0.0000	0.0000	0.0000	0.0000	183.4200	375.3313	560.2790	(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)	604.3008	473.3203	389.0198	207.8773	81.4158	0.0000	0.0000	0.0000	0.0000	202.2271	413.8162	617.7277	(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	90.0607	90.0787	90.0831	90.0614	89.9165	87.9000	87.9000	87.9000	87.9000	89.6861	89.9422	90.0741	(217)	
Fuel for water heating, kWh/month	174.5063	131.7044	107.2576	59.9452	30.9222	14.6549	8.9734	40.8276	65.5730	112.5044	150.0636	173.5384	(219)	
Water heating fuel used												1070.4709	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2989.7052	(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)												380.2032	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.76 * 1029 * 1.00) =										-625.7455		-625.7455	(233)	
Total delivered energy for all uses												3939.6338	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2989.7052	3.4800	104.0417	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1070.4709	3.4800	37.2524	(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	380.2032	13.1900	50.1488	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-625.7455	13.1900	-82.5358	(252)
Total energy cost			245.3946	(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] =	0.7960	(257)
SAP value			88.8958	
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	2989.7052	0.2160	645.7763	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1070.4709	0.2160	231.2217	(264)
Space and water heating			876.9980	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	380.2032	0.5190	197.3254	(268)
Energy saving/generation technologies				
PV Unit	-625.7455	0.5190	-324.7619	(269)
Total kg/year			814.4366	(272)
CO2 emissions per m2			9.6400	(273)
EI value			91.5713	
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	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					4.8100
Infiltration rate					0.4276 (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)	=	0.3635 (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	0.3817	0.3544	0.3635	0.3453	0.3453	0.3362	0.3272	0.3181	0.3090	0.3362	0.3181	0.3362 (22b)
Effective ac	0.5728	0.5628	0.5661	0.5596	0.5596	0.5565	0.5535	0.5506	0.5477	0.5565	0.5506	0.5565 (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)			12.7000	1.1450	14.5420		(27)
Ground Floor			42.2400	0.1100	4.6464	140.0000	5913.6000 (28a)
Brick and Block	92.8000	14.8200	77.9800	0.2400	18.7152	42.2200	3292.3156 (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) =	44.4596		(33)
Party Wall 1			44.0900	0.0000	0.0000	110.0000	4849.9000 (32)
Ground Floor Stud			65.9200			9.0000	593.2800 (32c)
First Floor Stud			91.3900			9.0000	822.5100 (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) = 17372.4056 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 205.6393 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9850 (36)
Total fabric heat loss (33) + (36) = 50.4446 (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	40.4036	39.6959	39.9260	39.4717	39.4717	39.2532	39.0406	38.8339	38.6329	39.2532	38.8339	39.2532 (38)
Heat transfer coeff	90.8482	90.1405	90.3706	89.9163	89.9163	89.6979	89.4852	89.2785	89.0775	89.6979	89.2785	89.6979 (39)
Average = Sum(39)m / 12 =												89.7838 (39)
HLP	1.0754	1.0670	1.0697	1.0643	1.0643	1.0618	1.0592	1.0568	1.0544	1.0618	1.0568	1.0618 (40)
HLP (average)												1.0628 (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 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	53.8217	47.8040	38.8768	29.4322	22.0009	18.5741	20.0700	26.0877	35.0149	44.4595	51.8907	55.3176	(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	579.7969	575.1332	552.7404	518.1279	482.7139	451.1105	432.7575	441.3852	461.4190	496.2476	534.8703	564.0633	(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			
Southeast				3.5300	45.1778	0.6300	0.7000	0.7700	48.7385 (77)			
Southwest				0.9900	45.1778	0.6300	0.7000	0.7700	13.6689 (79)			
Northwest				8.1800	14.6176	0.6300	0.7000	0.7700	36.5429 (81)			
Solar gains	98.9502	154.1808	241.2580	348.4258	411.5303	462.8802	434.9168	376.6640	292.8284	192.1217	120.4237	81.7820 (83)
Total gains	678.7471	729.3140	793.9985	866.5538	894.2441	913.9907	867.6743	818.0491	754.2474	688.3693	655.2939	645.8453 (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	53.1179	53.5349	53.3986	53.6685	53.6685	53.7992	53.9270	54.0519	54.1738	53.7992	54.0519	53.7992	
alpha	4.5412	4.5690	4.5599	4.5779	4.5779	4.5866	4.5951	4.6035	4.6116	4.5866	4.6035	4.5866	
util living area	0.9834	0.9760	0.9519	0.8849	0.7510	0.5415	0.3985	0.4208	0.6839	0.8993	0.9682	0.9857 (86)	
MIT	19.9552	20.0741	20.3299	20.6481	20.8778	20.9785	20.9958	20.9948	20.9401	20.6811	20.2942	19.9477 (87)	
Th 2	20.0210	20.0279	20.0256	20.0301	20.0301	20.0322	20.0343	20.0363	20.0382	20.0322	20.0363	20.0322 (88)	
util rest of house	0.9790	0.9697	0.9391	0.8551	0.6919	0.4569	0.3017	0.3193	0.6004	0.8657	0.9585	0.9819 (89)	
MIT 2	19.0892	19.2114	19.4581	19.7589	19.9532	20.0232	20.0333	20.0350	20.0084	19.7971	19.4355	19.0911 (90)	
Living area fraction									fLA = Living area / (4) =			0.2135 (91)	
MIT	19.2741	19.3956	19.6442	19.9488	20.1506	20.2272	20.2388	20.2400	20.2073	19.9859	19.6189	19.2740 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2741	19.3956	19.6442	19.9488	20.1506	20.2272	20.2388	20.2400	20.2073	19.9859	19.6189	19.2740 (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	0.9747	0.9647	0.9331	0.8522	0.6998	0.4745	0.3225	0.3411	0.6161	0.8638	0.9532	0.9780	(94)
Useful gains	661.5949	703.5517	740.9184	738.4958	625.7601	433.6655	279.8082	278.9969	464.6669	594.6085	624.6541	631.6647	(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	1305.8622	1270.5851	1142.6680	939.5173	687.9155	441.9567	280.8761	280.3317	490.5786	770.1352	1046.2427	1280.3473	(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	479.3348	381.0464	298.9017	144.7355	46.2436	0.0000	0.0000	0.0000	0.0000	130.5918	303.5438	482.6199	(98)
Space heating												2267.0176	(98)
Space heating per m2											(98) / (4) =	26.8350	(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													2499.4681	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	479.3348	381.0464	298.9017	144.7355	46.2436	0.0000	0.0000	0.0000	0.0000	130.5918	303.5438	482.6199	(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)	528.4838	420.1173	329.5499	159.5760	50.9852	0.0000	0.0000	0.0000	0.0000	143.9822	334.6679	532.1057	(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	90.0063	90.0184	90.0016	89.9334	89.5287	87.9000	87.9000	87.9000	87.9000	89.4854	89.8413	90.0090	(217)	
Fuel for water heating, kWh/month	169.9861	131.9835	106.9668	58.8019	35.9977	8.7984	4.2555	33.8708	60.1566	108.3472	144.8448	170.2592	(219)	
Water heating fuel used												1034.2685	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2499.4681	(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)													380.2032	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.76 * 1156 * 1.00) =										-702.9883			-702.9883	(233)
Total delivered energy for all uses													3335.9515	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2499.4681	7.6100	190.2095	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1034.2685	7.6100	78.7078	(247)
Pumps and fans for heating	75.0000	31.0800	23.3100	(249)
Pump for solar water heating	50.0000	31.0800	15.5400	(249)
Energy for lighting	380.2032	31.0800	118.1671	(250)
Additional standing charges			105.0000	(251)
Energy saving/generation technologies				
PV Unit	-702.9883	31.0800	-218.4887	(252)
Total energy cost			312.4457	(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	2499.4681	0.2160	539.8851	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1034.2685	0.2160	223.4020	(264)
Space and water heating			763.2871	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	380.2032	0.5190	197.3254	(268)
Energy saving/generation technologies				
PV Unit	-702.9883	0.5190	-364.8509	(269)
Total kg/year			660.6366	(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	2499.4681	1.2200	3049.3511 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1034.2685	1.2200	1261.8075 (264)
Space and water heating			4311.1587 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	380.2032	3.0700	1167.2237 (268)
Energy saving/generation technologies			
PV Unit	-702.9883	3.0700	-2158.1739 (269)
Primary energy kWh/year			3703.9584 (272)
Primary energy kWh/m2/year			43.8442 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 38	Issued on Date	07/03/2024
Assessment Reference	As Build	Prop Type Ref	Block H
Project	12 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.79	TER	18.36
Environmental	90 B	% DER<TER	24.88		
CO ₂ Emissions (t/year)	0.85	DFEE	42.78	TFEE	52.65
General Requirements Compliance	Pass	% DFEE<TFEE	18.74		

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 38	Issued on Date	07/03/2024
Assessment Reference	As Build	Prop Type Ref	Block H
Project	12 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.79	TER	18.36
Environmental	90 B	% DER<TER	24.88		
CO ₂ Emissions (t/year)	0.85	DFEE	42.78	TFEE	52.65
General Requirements Compliance	Pass	% DFEE<TFEE	18.74		

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

Wall 000003

Wall Type: Standard Wall

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

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

Unheated space: None		
Total thickness: 330 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 38	Issued on Date	07/03/2024
Assessment Reference	As Build	Prop Type Ref	Block H
Project	12 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.79	TER	18.36
Environmental	90 B	% DER<TER	24.88		
CO ₂ Emissions (t/year)	0.85	DFEE	42.78	TFEE	52.65
General Requirements Compliance	Pass	% DFEE<TFEE	18.74		

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

Building Elements

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

Floor Type: Suspended Floor

Area = 42.17 m², Perimeter = 18.32 m, Wall thickness = 300.00 mm, Soil: Clay

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

Floor height above ground: h = 0.000 m

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

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.1700			
Layer 1	Extruded polystyrene						
	Main construction	100	0.0270	3.7037	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Extruded polystyrene						
	Main construction	200	0.0270	7.4074	91.67		
	Main construction	200	2.3000	0.0870	8.33		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Concrete, reinforced (1% steel)						
	Main construction	75	2.3000	0.0326	100.00	2000	1000
Layer 4	Screed						
	Main construction	75	1.1500	0.0652	100.00	1200	1000
Int surface				0.1700			

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

Unheated space: None

Total thickness: 450 mm

U-value: 0.11 W/m² K

Kappa: 140.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 38			Issued on Date	07/03/2024
Assessment Reference	As Build	Prop Type Ref	Block H		
Property	12 Fieldfare Crescent, BOTLEY, SO32 2TW				
SAP Rating	88 B	DER	13.79	TER	18.36
Environmental	90 B	% DER<TER	24.88		
CO ₂ Emissions (t/year)	0.85	DFEE	42.78	TFEE	52.65
General Requirements Compliance	Pass	% DFEE<TFEE	18.74		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	South 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	18.04	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	205.64	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	77.98

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	44.09

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Stud	Plasterboard on timber frame		9.00	65.92
First Floor Stud	Plasterboard on timber frame		9.00	91.39

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/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.24

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Other	0.11	140.00	42.24

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
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/m ² K)
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 (m ²)	Curtain Closed
Front Elevation	Half Glazed Door	[1] Brick and Block	South East							2.12	
Front Elevation	Window	[1] Brick and Block	South East	None	0.00					1.47	
Rear Elevation	Window	[1] Brick and Block	North West	None	0.00					8.18	
Side Elevation	Window	[1] Brick and Block	South West	None	0.00					0.99	
Front Elevation	Window	[1] Brick and Block	South East	None	0.00					2.06	

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)	0.49	0.093	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.26	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	2.75	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	2.40	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.51	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.77	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	8.66	0.021	No	Knauf P5
Independently assessed	E4 Jamb	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	8.79	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.79	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.79	0.035	No	Knauf P29 Halved

Y-value

0.034

W/m²K

18.0 Pressure Testing

Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.81	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

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

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

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

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Combi boiler type	Standard Combi
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
	0.76	South East	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£61	B 89	