



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 11 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 37				Issued on Date	07/03/2024
Assessment Reference	As Built	Prop Type Ref	Block H			
Property	11 Fieldfare Crescent, BOTLEY, SO32 2TW					
SAP Rating	88 B	DER	13.83	TER	18.48	
Environmental	90 B	% DER<TER	25.14			
CO ₂ Emissions (t/year)	0.86	DFEE	42.95	TFEE	53.25	
General Requirements Compliance	Pass	% DFEE<TFEE	19.34			
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)	18.48	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.83	kgCO ₂ /m ²	Pass
	-4.65 (-25.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.25	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	42.95	kWh/m ² /yr	
	-10.3 (-19.3%)	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	4.68 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

0.99 m², No overhang

Windows facing South East

3.53 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

4.68 (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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SAP Rating	88 B	DER	13.83
Environmental	90 B	TER	18.48
CO ₂ Emissions (t/year)	0.86	% DER<TER	25.14
General Requirements Compliance	Pass	DFEE	42.95
		TFEE	53.25
		% DFEE<TFEE	19.34
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.093	0.49	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	1.26	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	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	8.78	0.39	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.10	0.39	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.10	0.36	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.78	1.40	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.79	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.79	0.31	Knauf P29 Halved

Total: **5.98** W/mK:
Y-Value: **0.034** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	0.86	DFEE	42.95	TFEE	53.25
General Requirements Compliance	Pass	% DFEE<TFEE	19.34		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

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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) 18.48 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.83 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.0 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: 4.68 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading:
Average
Windows facing North East: 0.99 m², No overhang
Windows facing South East: 3.53 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					4.6800
Infiltration rate					0.4211 (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) =	0.3580 (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	0.4564	0.4475	0.4385	0.3938	0.3848	0.3401	0.3401	0.3311	0.3580	0.3848	0.4027	0.4206 (22b)
Effective ac	0.6042	0.6001	0.5962	0.5775	0.5740	0.5578	0.5578	0.5548	0.5641	0.5740	0.5811	0.5885 (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	70.0000	3086.3000 (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) = 15608.8056 (34)
184.7633 (35)
5.9830 (36)
(33) + (36) = 50.4426 (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	42.6128	42.3275	42.0479	40.7345	40.4887	39.3448	39.3448	39.1330	39.7854	40.4887	40.9858	41.5056 (38)
Heat transfer coeff	93.0554	92.7701	92.4904	91.1770	90.9313	89.7874	89.7874	89.5755	90.2280	90.9313	91.4284	91.9481 (39)
Average = Sum(39)m / 12 =												91.1759 (39)
HLP	1.1015	1.0981	1.0948	1.0793	1.0764	1.0628	1.0628	1.0603	1.0680	1.0764	1.0822	1.0884 (40)
HLP (average)												1.0793 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy conte	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
Energy content (annual)										Total = Sum(45)m =		1488.1401 (45)

FULL SAP CALCULATION PRINTOUT

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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		
Northeast				0.9900	11.2829	0.6300	0.7000	0.7700		3.4137 (75)		
Southeast				3.5300	36.7938	0.6300	0.7000	0.7700		39.6937 (77)		
Northwest				8.1800	11.2829	0.6300	0.7000	0.7700		28.2064 (81)		
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921 (83)
Total gains	463.7403	522.1820	584.5864	658.5033	714.7733	708.6550	672.1876	616.3300	553.3837	488.1907	448.3901	440.5543 (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	46.5936	46.7368	46.8781	47.5534	47.6819	48.2894	48.2894	48.4036	48.0536	47.6819	47.4227	47.1546	
alpha	4.1062	4.1158	4.1252	4.1702	4.1788	4.2193	4.2193	4.2269	4.2036	4.1788	4.1615	4.1436	
util living area	0.9951	0.9914	0.9814	0.9496	0.8682	0.7157	0.5603	0.6225	0.8522	0.9684	0.9915	0.9960	(86)
MIT	19.4525	19.6166	19.9114	20.3196	20.6793	20.9036	20.9736	20.9594	20.7845	20.3263	19.8244	19.4288	(87)
Th 2	19.9996	20.0024	20.0051	20.0178	20.0202	20.0313	20.0313	20.0334	20.0270	20.0202	20.0154	20.0103	(88)
util rest of house	0.9938	0.9991	0.9763	0.9350	0.8291	0.6365	0.4489	0.5107	0.7938	0.9566	0.9889	0.9950	(89)
MIT 2	18.5831	18.7485	19.0428	19.4512	19.7866	19.9790	20.0223	20.0181	19.8907	19.4651	18.9662	18.5678	(90)
Living area fraction	18.7687	18.9338	19.2281	19.6365	19.9771	20.1763	20.2253	20.2190	20.0814	19.6489	19.1494	18.7515	(91)
MIT	18.7687	18.9338	19.2281	19.6365	19.9771	20.1763	20.2253	20.2190	20.0814	19.6489	19.1494	18.7515	(92)
Temperature adjustment	18.7687	18.9338	19.2281	19.6365	19.9771	20.1763	20.2253	20.2190	20.0814	19.6489	19.1494	18.7515	(93)
adjusted MIT	18.7687	18.9338	19.2281	19.6365	19.9771	20.1763	20.2253	20.2190	20.0814	19.6489	19.1494	18.7515	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	459.9030	514.8322	567.7269	611.1548	591.2241	460.1395	317.4509	328.8358	441.3634	464.1726	442.0177	437.5835	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1346.3891	1301.9163	1177.2312	978.9257	752.6505	500.6809	325.5084	342.0861	539.6919	822.8304	1101.6536	1337.9875	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	659.5456	528.9205	453.4713	264.7951	120.1012	0.0000	0.0000	0.0000	0.0000	266.8414	474.9379	669.9005	(98)
Space heating												3438.5135	(98)
Space heating per m2												40.7021	(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												3791.0844 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	659.5456	528.9205	453.4713	264.7951	120.1012	0.0000	0.0000	0.0000	0.0000	266.8414	474.9379	669.9005 (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)	727.1727	583.1538	499.9683	291.9461	132.4159	0.0000	0.0000	0.0000	0.0000	294.2023	523.6360	738.5893 (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	90.0798	90.0345	89.9297	89.6758	89.1517	87.9000	87.9000	87.9000	87.9000	89.6568	89.9636	87.9000 (216)
Fuel for water heating, kWh/month	201.8738	177.5227	185.4547	165.0534	161.4827	144.5801	137.1816	152.8437	153.3041	171.2773	182.5757	196.4159 (219)
Water heating fuel used												2029.5657 (219)
Annual totals kWh/year												
Space heating fuel - main system												3791.0844 (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 (233)
Total delivered energy for all uses												5650.1077 (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	3791.0844	0.2160	818.8742 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2029.5657	0.2160	438.3862 (264)
Space and water heating			1257.2604 (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			1168.7489 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.8300 (273)

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

DER		13.8300 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		31.9923 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		31.9923 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1404 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3904 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3318 (21)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)				
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)				
Adj infilt rate	0.4231	0.4148	0.4065	0.3650	0.3567	0.3152	0.3152	0.3069	0.3318	0.3567	0.3733	0.3899	(22b)				
Effective ac	0.5895	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5697	0.5760	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Semi-glazed door			2.1200	1.2000	2.5440			(26a)				
TER Opening Type (Uw = 1.40)			12.7000	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, m2)			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/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.6804 (36)				
Total fabric heat loss						(33) + (36) =		54.0803 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.5779	Feb 41.3328	Mar 41.0926	Apr 39.9642	May 39.7531	Jun 38.7703	Jul 38.7703	Aug 38.5883	Sep 39.1488	Oct 39.7531	Nov 40.1802	Dec 40.6267 (38)
Heat transfer coeff	95.6582	95.4132	95.1729	94.0445	93.8334	92.8506	92.8506	92.6686	93.2292	93.8334	94.2605	94.7070 (39)
Average = Sum(39)m / 12 =												94.0435 (39)
HLP	Jan 1.1323	Feb 1.1294	Mar 1.1266	Apr 1.1132	May 1.1107	Jun 1.0991	Jul 1.0991	Aug 1.0969	Sep 1.1036	Oct 1.1107	Nov 1.1158	Dec 1.1211 (40)
HLP (average)												1.1132 (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)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	205.2472	180.9689	188.4094	167.1096	161.7916	142.4970	136.5230	152.1911	153.8719	175.2138	186.9107	200.3789 (64)
Heat gains from water heating, kWh/month	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			
Northeast				0.9900	11.2829	0.6300	0.7000	0.7700	3.4137 (75)			
Southeast				3.5300	36.7938	0.6300	0.7000	0.7700	39.6937 (77)			
Northwest				8.1800	11.2829	0.6300	0.7000	0.7700	28.2064 (81)			
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921 (83)
Total gains	471.6030	530.0456	591.8547	665.1341	720.7636	714.0061	677.5439	622.3252	560.0218	495.4663	456.2578	448.4198 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.3294	61.4870	61.6422	62.3818	62.5222	63.1839	63.1839	63.3080	62.9274	62.5222	62.2389	61.9454	
alpha	5.0886	5.0991	5.1095	5.1588	5.1681	5.2123	5.2123	5.2205	5.1952	5.1681	5.1493	5.1297	
util living area	0.9986	0.9971	0.9924	0.9730	0.9065	0.7535	0.5851	0.6519	0.8907	0.9850	0.9971	0.9989	(86)
MIT	19.7436	19.8756	20.1150	20.4507	20.7544	20.9369	20.9864	20.9769	20.8380	20.4537	20.0432	19.7224	(87)
Th 2	19.9745	19.9769	19.9792	19.9901	19.9921	20.0016	20.0016	20.0033	19.9979	19.9921	19.9880	19.9837	(88)
util rest of house	0.9981	0.9961	0.9896	0.9620	0.8682	0.6651	0.4615	0.5267	0.8308	0.9770	0.9960	0.9985	(89)
MIT 2	18.2942	18.4887	18.8392	19.3293	19.7423	19.9578	19.9963	19.9933	19.8590	19.3407	18.7421	18.2698	(90)
Living area fraction	18.6035	18.7847	19.1115	19.5687	19.9583	20.1667	20.2076	20.2032	20.0680	19.5782	19.0198	18.5798	(91)
MIT	18.6035	18.7847	19.1115	19.5687	19.9583	20.1667	20.2076	20.2032	20.0680	19.5782	19.0198	18.5798	(92)
Temperature adjustment	18.6035	18.7847	19.1115	19.5687	19.9583	20.1667	20.2076	20.2032	20.0680	19.5782	19.0198	18.5798	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9971	0.9944	0.9861	0.9561	0.8666	0.6811	0.4880	0.5533	0.8358	0.9725	0.9942	0.9977	(94)
Ext temp.	470.2329	527.0573	583.6509	635.9198	624.6360	486.2739	330.6095	344.3472	468.0895	481.8171	453.6319	447.4108	(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	1368.2470	1324.7832	1200.2693	1003.3291	774.9024	516.8756	334.9720	352.4369	556.3878	842.4578	1123.5634	1361.8685	(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	668.1225	536.0718	458.7641	264.5347	111.7982	0.0000	0.0000	0.0000	0.0000	268.3167	482.3507	680.3565	(98)
Space heating per m2												3470.3152	(98)
												41.0785	(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												3715.5409 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	668.1225	536.0718	458.7641	264.5347	111.7982	0.0000	0.0000	0.0000	0.0000	268.3167	482.3507	680.3565 (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)	715.3346	573.9527	491.1821	283.2278	119.6983	0.0000	0.0000	0.0000	0.0000	287.2770	516.4355	728.4331 (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	87.8046	87.6186	87.2067	86.2024	84.1415	80.3000	80.3000	80.3000	80.3000	86.1208	87.3323	80.3000 (216)
Fuel for water heating, kWh/month	233.7545	206.5417	216.0492	193.8573	192.2852	177.4558	170.0162	189.5282	191.6213	203.4512	214.0225	228.0011 (219)
Water heating fuel used												2416.5840 (219)
Annual totals kWh/year												
Space heating fuel - main system												3715.5409 (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												6587.3280 (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	3715.5409	0.2160	802.5568 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2416.5840	0.2160	521.9821 (264)
Space and water heating			1324.5390 (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			1560.7894 (272)
Emissions per m2 for space and water heating			15.6787 (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) = (15.6787 * 1.00) + 2.3358 + 0.4608, rounded to 2 d.p.			18.4800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					30.0000 / (5) = 0.1404 (8)
Pressure test					Yes
Measured/design AP50					4.6800
Infiltration rate					0.3744 (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) =	0.3182 (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	0.4057	0.3978	0.3898	0.3500	0.3421	0.3023	0.3023	0.2943	0.3182	0.3421	0.3580	0.3739 (22b)
Effective ac	0.5823	0.5791	0.5760	0.5613	0.5585	0.5457	0.5457	0.5433	0.5506	0.5585	0.5641	0.5699 (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	70.0000	3086.3000 (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) (28)...(30) + (32) + (32a)...(32e) = 15228.6456 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 180.2633 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9830 (36)
Total fabric heat loss (33) + (36) = 50.4426 (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	41.0711	40.8457	40.6248	39.5870	39.3928	38.4889	38.4889	38.3215	38.8371	39.3928	39.7856	40.1962 (38)
Heat transfer coeff	91.5137	91.2883	91.0673	90.0295	89.8354	88.9315	88.9315	88.7641	89.2797	89.8354	90.2282	90.6388 (39)
Average = Sum(39)m / 12 =												90.0286 (39)
HLP	1.0833	1.0806	1.0780	1.0657	1.0634	1.0527	1.0527	1.0507	1.0568	1.0634	1.0680	1.0729 (40)
HLP (average)												1.0657 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
Daily hot water use	104.0400	100.2567	96.4734	92.6902	88.9069	85.1236	85.1236	88.9069	92.6902	96.4734	100.2567	104.0400 (44)
Energy conte	154.2883	134.9415	139.2476	121.3994	116.4856	100.5182	93.1449	106.8852	108.1617	126.0520	137.5957	149.4200 (45)
Energy content (annual)										Total = Sum(45)m =		1488.1401 (45)

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

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	127.1196	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5287	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
Northeast			0.9900		11.2829		0.6300		0.7000		0.7700		3.4137 (75)
Southeast			3.5300		36.7938		0.6300		0.7000		0.7700		39.6937 (77)
Northwest			8.1800		11.2829		0.6300		0.7000		0.7700		28.2064 (81)
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921	(83)
Total gains	426.5945	485.8256	549.8760	626.0293	683.7518	679.6771	644.9445	586.8618	523.1232	455.6159	413.2020	404.1965	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.2245	46.3387	46.4511	46.9866	47.0881	47.5667	47.5667	47.6564	47.3812	47.0881	46.8831	46.6707	
alpha	4.0816	4.0892	4.0967	4.1324	4.1392	4.1711	4.1711	4.1771	4.1587	4.1392	4.1255	4.1114	
util living area	0.9961	0.9927	0.9837	0.9542	0.8768	0.7292	0.5746	0.6408	0.8659	0.9731	0.9931	0.9969	(86)
MIT	19.4014	19.5685	19.8691	20.2842	20.6565	20.8927	20.9698	20.9529	20.7623	20.2854	19.7730	19.3736	(87)
Th 2	20.0145	20.0167	20.0189	20.0290	20.0308	20.0397	20.0397	20.0413	20.0363	20.0308	20.0270	20.0230	(88)
util rest of house	0.9951	0.9909	0.9793	0.9410	0.8400	0.6517	0.4629	0.5293	0.8114	0.9630	0.9910	0.9961	(89)
MIT 2	18.5460	18.7140	19.0141	19.4283	19.7775	19.9801	20.0290	20.0229	19.8824	19.4363	18.9265	18.5248	(90)
Living area fraction	18.7286	18.8964	19.1966	19.6110	19.9651	20.1749	20.2298	20.2214	20.0702	19.6175	19.1072	18.7060	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7286	18.8964	19.1966	19.6110	19.9651	20.1749	20.2298	20.2214	20.0702	19.6175	19.1072	18.7060	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	423.7164	480.0099	535.8308	584.6865	572.3736	451.0503	313.5542	323.8030	425.6286	436.1942	408.3752	401.9988	(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	1320.4135	1277.7068	1156.2451	964.3054	742.4963	495.7835	322.8004	339.2025	533.0147	810.0893	1083.3833	1314.8033	(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	667.1427	536.0523	461.5883	273.3257	126.5712	0.0000	0.0000	0.0000	0.0000	278.1779	486.0058	679.1266	(98)
Space heating												3507.9904	(98)
Space heating per m2												41.5245	(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	835.9560	658.0930	674.6072	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8311	0.8934	0.8612	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	694.7300	587.9240	580.9430	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.1083	847.5611	781.4462	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	140.6724	193.1700	149.1744	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												483.0168 (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	35.1681	48.2925	37.2936	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												120.7542 (107)
Space cooling per m2												1.4294 (108)
Energy for space heating												41.5245 (99)
Energy for space cooling												1.4294 (108)
Total												42.9539 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.0 (109)

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Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1404 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3904 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3318 (21)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)				
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)				
Adj infilt rate	0.4231	0.4148	0.4065	0.3650	0.3567	0.3152	0.3152	0.3069	0.3318	0.3567	0.3733	0.3899	(22b)				
Effective ac	0.5895	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5697	0.5760	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Semi-glazed door			2.1200	1.2000	2.5440			(26a)					
TER Opening Type (Uw = 1.40)			12.7000	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, m2)			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/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.6804 (36)					
Total fabric heat loss						(33) + (36) =		54.0803 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 41.5779	Feb 41.3328	Mar 41.0926	Apr 39.9642	May 39.7531	Jun 38.7703	Jul 38.7703	Aug 38.5883	Sep 39.1488	Oct 39.7531	Nov 40.1802	Dec 40.6267	(38)
Heat transfer coeff	95.6582	95.4132	95.1729	94.0445	93.8334	92.8506	92.8506	92.6686	93.2292	93.8334	94.2605	94.7070	(39)
Average = Sum(39)m / 12 =												94.0435	(39)
HLP	Jan 1.1323	Feb 1.1294	Mar 1.1266	Apr 1.1132	May 1.1107	Jun 1.0991	Jul 1.0991	Aug 1.0969	Sep 1.1036	Oct 1.1107	Nov 1.1158	Dec 1.1211	(40)
HLP (average)												1.1132	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
Daily hot water use	Jan 104.0400	Feb 100.2567	Mar 96.4734	Apr 92.6902	May 88.9069	Jun 85.1236	Jul 85.1236	Aug 88.9069	Sep 92.6902	Oct 96.4734	Nov 100.2567	Dec 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	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		
Northeast					0.9900	11.2829	0.6300	0.7000			0.7700			3.4137 (75)		
Southeast					3.5300	36.7938	0.6300	0.7000			0.7700			39.6937 (77)		
Northwest					8.1800	11.2829	0.6300	0.7000			0.7700			28.2064 (81)		
Solar gains					71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921 (83)
Total gains					426.5945	485.8256	549.8760	626.0293	683.7518	679.6771	644.9445	586.8618	523.1232	455.6159	413.2020	404.1965 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.3294	61.4870	61.6422	62.3818	62.5222	63.1839	63.1839	63.3080	62.9274	62.5222	62.2389	61.9454	
alpha	5.0886	5.0991	5.1095	5.1588	5.1681	5.2123	5.2123	5.2205	5.1952	5.1681	5.1493	5.1297	
util living area	0.9991	0.9981	0.9945	0.9788	0.9211	0.7779	0.6106	0.6830	0.9117	0.9895	0.9982	0.9993	(86)
MIT	19.6937	19.8269	20.0698	20.4123	20.7281	20.9265	20.9835	20.9714	20.8135	20.4121	19.9957	19.6733	(87)
Th 2	19.9745	19.9769	19.9792	19.9901	19.9921	20.0016	20.0016	20.0033	19.9979	19.9921	19.9880	19.9837	(88)
util rest of house	0.9988	0.9974	0.9924	0.9700	0.8868	0.6912	0.4836	0.5557	0.8587	0.9838	0.9974	0.9991	(89)
MIT 2	18.7775	18.9124	19.1562	19.5024	19.7998	19.9659	19.9972	19.9946	19.8851	19.5072	19.0900	18.7644	(90)
Living area fraction									fLA = Living area / (4) =			0.2134	(91)
MIT	18.9730	19.1075	19.3512	19.6966	19.9980	20.1709	20.2077	20.2031	20.0832	19.7003	19.2833	18.9584	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9730	19.1075	19.3512	19.6966	19.9980	20.1709	20.2077	20.2031	20.0832	19.7003	19.2833	18.9584	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9966	0.9907	0.9667	0.8871	0.7074	0.5110	0.5830	0.8643	0.9815	0.9967	0.9988	(94)
Ext temp.	425.9011	484.1577	544.7440	605.1607	606.5427	480.7996	329.5861	342.1681	452.1103	447.1717	411.8299	403.7016	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1403.5951	1355.5867	1223.0850	1015.3594	778.6253	517.2643	334.9730	352.4235	557.8115	853.9128	1148.4063	1397.7210	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(98)
Space heating per m2	727.4043	585.6003	504.6857	295.3431	128.0294	0.0000	0.0000	0.0000	0.0000	302.6153	530.3350	739.5504	(98)
												3813.5636	(98)
												45.1416	(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	872.7956	687.0944	704.2813	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8472	0.9130	0.8795	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	739.3915	627.2998	619.4199	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.1083	847.5611	781.4462	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	108.5161	163.8744	120.5475	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												392.9380	(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	27.1290	40.9686	30.1369	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												98.2345 (107)
Space cooling per m2												1.1628 (108)
Energy for space heating												45.1416 (99)
Energy for space cooling												1.1628 (108)
Total												46.3044 (109)
Target Fabric Energy Efficiency (TFEE)												53.3 (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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1871 (8)
Pressure test					Yes
Measured/design AP50					4.6800
Infiltration rate					0.4211 (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) =	0.3580 (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	0.3759	0.3490	0.3580	0.3401	0.3401	0.3311	0.3222	0.3132	0.3043	0.3311	0.3132	0.3311 (22b)
Effective ac	0.5706	0.5609	0.5641	0.5578	0.5578	0.5548	0.5519	0.5491	0.5463	0.5548	0.5491	0.5548 (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	70.0000	3086.3000 (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) = 15608.8056 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 184.7633 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9830 (36)
Total fabric heat loss (33) + (36) = 50.4426 (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	40.2486	39.5623	39.7854	39.3448	39.3448	39.1330	38.9268	38.7262	38.5313	39.1330	38.7262	39.1330 (38)
Heat transfer coeff	90.6912	90.0049	90.2280	89.7874	89.7874	89.5755	89.3693	89.1688	88.9739	89.5755	89.1688	89.5755 (39)
Average = Sum(39)m / 12 =												89.6589 (39)
HLP	1.0735	1.0654	1.0680	1.0628	1.0628	1.0603	1.0579	1.0555	1.0532	1.0603	1.0555	1.0603 (40)
HLP (average)												1.0613 (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
												0.9900	14.6176	0.6300	0.7000	0.7700	4.4227 (75)
Northeast												0.9900	14.6176	0.6300	0.7000	0.7700	4.4227 (75)
Southeast												3.5300	45.1778	0.6300	0.7000	0.7700	48.7385 (77)
Northwest												8.1800	14.6176	0.6300	0.7000	0.7700	36.5429 (81)
Solar gains	89.7040	142.0860	227.9539	337.2869	404.2113	457.0995	428.5196	367.1255	279.5659	178.6890	109.6674	73.8217 (83)					
Total gains	669.5009	717.2192	780.6944	855.4148	886.9252	908.2099	861.2771	808.5106	740.9849	674.9365	644.5376	637.8850 (84)					

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.8081	48.1727	48.0536	48.2894	48.2894	48.4036	48.5153	48.6244	48.7309	48.4036	48.6244	48.4036
alpha	4.1872	4.2115	4.2036	4.2193	4.2193	4.2269	4.2344	4.2416	4.2487	4.2269	4.2416	4.2269
util living area	0.9789	0.9708	0.9450	0.8760	0.7433	0.5395	0.3994	0.4232	0.6833	0.8924	0.9623	0.9816 (86)
MIT	19.8527	19.9762	20.2499	20.5953	20.8515	20.9705	20.9935	20.9920	20.9223	20.6316	20.2157	19.8459 (87)
Th 2	20.0225	20.0292	20.0270	20.0313	20.0313	20.0334	20.0354	20.0373	20.0392	20.0334	20.0373	20.0334 (88)
util rest of house	0.9740	0.9640	0.9318	0.8466	0.6863	0.4567	0.3032	0.3221	0.6026	0.8594	0.9519	0.9772 (89)
MIT 2	18.9969	19.1232	19.3875	19.7149	19.9348	20.0202	20.0337	20.0352	19.9983	19.7569	19.3663	18.9990 (90)
Living area fraction									fLA = Living area / (4) =			0.2134 (91)
MIT	19.1795	19.3052	19.5716	19.9028	20.1304	20.2230	20.2385	20.2394	20.1955	19.9436	19.5476	19.1798 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1795	19.3052	19.5716	19.9028	20.1304	20.2230	20.2385	20.2394	20.1955	19.9436	19.5476	19.1798 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9685	0.9577	0.9243	0.8422	0.6926	0.4735	0.3238	0.3437	0.6166	0.8558	0.9454	0.9722 (94)
Useful gains	648.3964	686.8559	721.6291	720.4143	614.2482	430.0289	278.8478	277.8936	456.9074	577.6167	609.3275	620.1232 (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	1295.0291	1260.5395	1134.3088	934.0399	685.1150	440.9830	280.4881	279.9370	488.9588	765.2973	1038.5996	1270.1588 (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	481.0948	385.5154	307.0336	153.8104	52.7249	0.0000	0.0000	0.0000	0.0000	139.6344	309.0760	483.6265 (98)
Space heating												2312.5160 (98)
RHI space heating demand												2313 (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	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) =	0.1871 (8)	
Pressure test															Yes		
Measured/design AP50															4.6800		
Infiltration rate															0.4211 (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) =					0.3580 (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	0.4564	0.4475	0.4385	0.3938	0.3848	0.3401	0.3401	0.3311	0.3580	0.3848	0.4027	0.4206 (22b)					
Effective ac	0.6042	0.6001	0.5962	0.5775	0.5740	0.5578	0.5578	0.5548	0.5641	0.5740	0.5811	0.5885 (25)					

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
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, m2)			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	70.0000	3086.3000	(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) =	15608.8056	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							184.7633	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9830	(36)					
Total fabric heat loss						(33) + (36) =	50.4426	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 42.6128	Feb 42.3275	Mar 42.0479	Apr 40.7345	May 40.4887	Jun 39.3448	Jul 39.3448	Aug 39.1330	Sep 39.7854	Oct 40.4887	Nov 40.9858	Dec 41.5056	(38)
Heat transfer coeff	93.0554	92.7701	92.4904	91.1770	90.9313	89.7874	89.7874	89.5755	90.2280	90.9313	91.4284	91.9481	(39)
Average = Sum(39)m / 12 =												91.1759	(39)
HLP	Jan 1.1015	Feb 1.0981	Mar 1.0948	Apr 1.0793	May 1.0764	Jun 1.0628	Jul 1.0628	Aug 1.0603	Sep 1.0680	Oct 1.0764	Nov 1.0822	Dec 1.0884	(40)
HLP (average)												1.0793	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5424 (42)
Average daily hot water use (litres/day)												94.5818 (43)
Daily hot water use	Jan 104.0400	Feb 100.2567	Mar 96.4734	Apr 92.6902	May 88.9069	Jun 85.1236	Jul 85.1236	Aug 88.9069	Sep 92.6902	Oct 96.4734	Nov 100.2567	Dec 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			
Northeast				0.9900	11.2829	0.6300	0.7000	0.7700	3.4137 (75)			
Southeast				3.5300	36.7938	0.6300	0.7000	0.7700	39.6937 (77)			
Northwest				8.1800	11.2829	0.6300	0.7000	0.7700	28.2064 (81)			
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921 (83)
Total gains	651.1107	707.1099	761.2144	823.1980	867.0988	851.4897	810.9530	757.5380	702.8915	649.6319	622.2005	623.8554 (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	46.5936	46.7368	46.8781	47.5534	47.6819	48.2894	48.2894	48.4036	48.0536	47.6819	47.4227	47.1546	
alpha	4.1062	4.1158	4.1252	4.1702	4.1788	4.2193	4.2193	4.2269	4.2036	4.1788	4.1615	4.1436	
util living area	0.9835	0.9752	0.9558	0.9040	0.7967	0.6270	0.4749	0.5242	0.7559	0.9239	0.9732	0.9859	(86)
MIT	19.7059	19.8603	20.1296	20.4888	20.7794	20.9417	20.9857	20.9786	20.8698	20.5078	20.0534	19.6792	(87)
Th 2	19.9996	20.0024	20.0051	20.0178	20.0202	20.0313	20.0313	20.0334	20.0270	20.0202	20.0154	20.0103	(88)
util rest of house	0.9796	0.9694	0.9450	0.8803	0.7483	0.5481	0.3759	0.4227	0.6848	0.9001	0.9659	0.9826	(89)
MIT 2	18.8338	18.9880	19.2536	19.6063	19.8667	20.0013	20.0267	20.0258	19.9508	19.6328	19.1904	18.8159	(90)
Living area fraction									fLA = Living area / (4) =			0.2134	(91)
MIT	19.0199	19.1742	19.4406	19.7947	20.0615	20.2020	20.2314	20.2292	20.1469	19.8196	19.3745	19.0002	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0199	19.1742	19.4406	19.7947	20.0615	20.2020	20.2314	20.2292	20.1469	19.8196	19.3745	19.0002	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	634.6253	681.1473	713.7051	719.5512	650.8039	479.1271	321.8426	336.3025	488.1206	580.9123	597.1944	610.2688	(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	1369.7651	1324.2167	1196.8782	993.3432	760.3232	502.9905	326.0506	342.9996	545.5993	838.3483	1122.2423	1360.8478	(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	546.9441	432.1426	359.4808	197.1302	81.4824	0.0000	0.0000	0.0000	0.0000	191.5324	378.0345	558.4308	(98)
Space heating												2745.1778	(98)
Space heating per m2												(98) / (4) =	32.4950 (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													3026.6569 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	546.9441	432.1426	359.4808	197.1302	81.4824	0.0000	0.0000	0.0000	0.0000	191.5324	378.0345	558.4308	(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)	603.0254	476.4527	396.3404	217.3432	89.8372	0.0000	0.0000	0.0000	0.0000	211.1713	416.7966	615.6899	(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	89.9848	89.9266	89.7935	89.4777	88.8918	87.9000	87.9000	87.9000	87.9000	89.4323	89.8333	87.9000	(216)
Fuel for water heating, kWh/month	202.0871	177.7356	185.7360	165.4188	161.9549	144.5801	137.1816	152.8437	153.3041	171.7072	182.8406	196.6128	(219)
Water heating fuel used												2032.0024	(219)
Annual totals kWh/year													
Space heating fuel - main system												3026.6569	(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												4888.1169	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3026.6569	3.4800	105.3277 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2032.0024	3.4800	70.7137 (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			273.5468 (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] =	0.8873 (257)
SAP value		87.6219
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	3026.6569	0.2160	653.7579 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.0024	0.2160	438.9125 (264)
Space and water heating			1092.6704 (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			1004.1589 (272)
CO2 emissions per m2			11.8900 (273)
EI value			89.6079
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	$3.48 / 0.8908 = 3.907$, stars = 4
Water heating environmental impact	$0.216 / 0.8908 = 0.2425$, 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					4.6800
Infiltration rate					0.4211 (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) =	0.3580 (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	0.3759	0.3490	0.3580	0.3401	0.3401	0.3311	0.3222	0.3132	0.3043	0.3311	0.3132	0.3311 (22b)
Effective ac	0.5706	0.5609	0.5641	0.5578	0.5578	0.5548	0.5519	0.5491	0.5463	0.5548	0.5491	0.5548 (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	70.0000	3086.3000 (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) = 15608.8056 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 184.7633 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9830 (36)
Total fabric heat loss (33) + (36) = 50.4426 (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	40.2486	39.5623	39.7854	39.3448	39.3448	39.1330	38.9268	38.7262	38.5313	39.1330	38.7262	39.1330 (38)
Heat transfer coeff	90.6912	90.0049	90.2280	89.7874	89.7874	89.5755	89.3693	89.1688	88.9739	89.5755	89.1688	89.5755 (39)
Average = Sum(39)m / 12 =												89.6589 (39)
HLP	1.0735	1.0654	1.0680	1.0628	1.0628	1.0603	1.0579	1.0555	1.0532	1.0603	1.0555	1.0603 (40)
HLP (average)												1.0613 (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		
Northeast				0.9900	14.6176	0.6300	0.7000	0.7700	4.4227 (75)			
Southeast				3.5300	45.1778	0.6300	0.7000	0.7700	48.7385 (77)			
Northwest				8.1800	14.6176	0.6300	0.7000	0.7700	36.5429 (81)			
Solar gains	89.7040	142.0860	227.9539	337.2869	404.2113	457.0995	428.5196	367.1255	279.5659	178.6890	109.6674	73.8217 (83)
Total gains	669.5009	717.2192	780.6944	855.4148	886.9252	908.2099	861.2771	808.5106	740.9849	674.9365	644.5376	637.8850 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.8081	48.1727	48.0536	48.2894	48.2894	48.4036	48.5153	48.6244	48.7309	48.4036	48.6244	48.4036
alpha	4.1872	4.2115	4.2036	4.2193	4.2193	4.2269	4.2344	4.2416	4.2487	4.2269	4.2416	4.2269
util living area	0.9789	0.9708	0.9450	0.8760	0.7433	0.5395	0.3994	0.4232	0.6833	0.8924	0.9623	0.9816 (86)
MIT	19.8527	19.9762	20.2499	20.5953	20.8515	20.9705	20.9935	20.9920	20.9223	20.6316	20.2157	19.8459 (87)
Th 2	20.0225	20.0292	20.0270	20.0313	20.0313	20.0334	20.0354	20.0373	20.0392	20.0334	20.0373	20.0334 (88)
util rest of house	0.9740	0.9640	0.9318	0.8466	0.6863	0.4567	0.3032	0.3221	0.6026	0.8594	0.9519	0.9772 (89)
MIT 2	18.9969	19.1232	19.3875	19.7149	19.9348	20.0202	20.0337	20.0352	19.9983	19.7569	19.3663	18.9990 (90)
Living area fraction									fLA = Living area / (4) =			0.2134 (91)
MIT	19.1795	19.3052	19.5716	19.9028	20.1304	20.2230	20.2385	20.2394	20.1955	19.9436	19.5476	19.1798 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1795	19.3052	19.5716	19.9028	20.1304	20.2230	20.2385	20.2394	20.1955	19.9436	19.5476	19.1798 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	648.3964	686.8559	721.6291	720.4143	614.2482	430.0289	278.8478	277.8936	456.9074	577.6167	609.3275	620.1232 (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	1295.0291	1260.5395	1134.3088	934.0399	685.1150	440.9830	280.4881	279.9370	488.9588	765.2973	1038.5996	1270.1588 (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	481.0948	385.5154	307.0336	153.8104	52.7249	0.0000	0.0000	0.0000	0.0000	139.6344	309.0760	483.6265 (98)
Space heating												2312.5160 (98)
Space heating per m2										(98) / (4) =		27.3735 (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												2549.6317	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	481.0948	385.5154	307.0336	153.8104	52.7249	0.0000	0.0000	0.0000	0.0000	139.6344	309.0760	483.6265	(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)	530.4242	425.0445	338.5156	169.5815	58.1311	0.0000	0.0000	0.0000	0.0000	153.9519	340.7673	533.2155	(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	89.9143	89.8611	89.6943	89.3049	88.6335	87.9000	87.9000	87.9000	87.9000	89.2116	89.7084	87.9000	(216)
Fuel for water heating, kWh/month	202.2454	177.8652	185.9414	165.7387	162.4269	144.5801	137.1816	152.8437	153.3041	172.1320	183.0952	196.7821	(219)
Water heating fuel used												2034.1365	(219)
Annual totals kWh/year													
Space heating fuel - main system												2549.6317	(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												4335.9832	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2549.6317	7.6100	194.0270 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2034.1365	7.6100	154.7978 (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			376.8132 (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	2549.6317	0.2160	550.7205 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2034.1365	0.2160	439.3735 (264)
Space and water heating			990.0939 (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			861.4935 (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	2549.6317	1.2200	3110.5507 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2034.1365	1.2200	2481.6466 (264)
Space and water heating			5592.1973 (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			4831.4970 (272)
Primary energy kWh/m2/year			57.1910 (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 (22.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£61 2.25 kg/m²	B 89	B 91
Total Savings	£61 2.25 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 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	£454	£378	£76
Space heating	£322	£322	£0
Water heating	£155	£94	£61
Lighting	£118	£118	£0
Generated (PV)	-£218	-£218	£0
Total cost of fuels	£377	£317	£60
Total cost of uses	£377	£316	£61
Delivered energy	51 kWh/m²	40 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	57 kWh/m²	45 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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1871 (8)
Pressure test					Yes
Measured/design AP50					4.6800
Infiltration rate					0.4211 (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) =	0.3580 (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	0.4564	0.4475	0.4385	0.3938	0.3848	0.3401	0.3401	0.3311	0.3580	0.3848	0.4027	0.4206 (22b)
Effective ac	0.6042	0.6001	0.5962	0.5775	0.5740	0.5578	0.5578	0.5548	0.5641	0.5740	0.5811	0.5885 (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	70.0000	3086.3000 (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) = 15608.8056 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 184.7633 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9830 (36)
Total fabric heat loss (33) + (36) = 50.4426 (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	42.6128	42.3275	42.0479	40.7345	40.4887	39.3448	39.3448	39.1330	39.7854	40.4887	40.9858	41.5056 (38)
Heat transfer coeff	93.0554	92.7701	92.4904	91.1770	90.9313	89.7874	89.7874	89.5755	90.2280	90.9313	91.4284	91.9481 (39)
Average = Sum(39)m / 12 =												91.1759 (39)
HLP	1.1015	1.0981	1.0948	1.0793	1.0764	1.0628	1.0628	1.0603	1.0680	1.0764	1.0822	1.0884 (40)
HLP (average)												1.0793 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5424 (42)
Average daily hot water use (litres/day) 94.5818 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF 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		
Northeast				0.9900	11.2829	0.6300	0.7000	0.7700		3.4137 (75)		
Southeast				3.5300	36.7938	0.6300	0.7000	0.7700		39.6937 (77)		
Northwest				8.1800	11.2829	0.6300	0.7000	0.7700		28.2064 (81)		
Solar gains	71.3138	131.9767	208.4740	305.0701	384.3849	400.3792	378.1954	316.1528	241.4725	153.3843	87.3302	59.7921 (83)
Total gains	651.1107	707.1099	761.2144	823.1980	867.0988	851.4897	810.9530	757.5380	702.8915	649.6319	622.2005	623.8554 (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	46.5936	46.7368	46.8781	47.5534	47.6819	48.2894	48.2894	48.4036	48.0536	47.6819	47.4227	47.1546	
alpha	4.1062	4.1158	4.1252	4.1702	4.1788	4.2193	4.2193	4.2269	4.2036	4.1788	4.1615	4.1436	
util living area	0.9835	0.9752	0.9558	0.9040	0.7967	0.6270	0.4749	0.5242	0.7559	0.9239	0.9732	0.9859 (86)	
MIT	19.7059	19.8603	20.1296	20.4888	20.7794	20.9417	20.9857	20.9786	20.8698	20.5078	20.0534	19.6792 (87)	
Th 2	19.9996	20.0024	20.0051	20.0178	20.0202	20.0313	20.0313	20.0334	20.0270	20.0202	20.0154	20.0103 (88)	
util rest of house	0.9796	0.9694	0.9450	0.8803	0.7483	0.5481	0.3759	0.4227	0.6848	0.9001	0.9659	0.9826 (89)	
MIT 2	18.8338	18.9880	19.2536	19.6063	19.8667	20.0013	20.0267	20.0258	19.9508	19.6328	19.1904	18.8159 (90)	
Living area fraction													0.2134 (91)
MIT	19.0199	19.1742	19.4406	19.7947	20.0615	20.2020	20.2314	20.2292	20.1469	19.8196	19.3745	19.0002 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.0199	19.1742	19.4406	19.7947	20.0615	20.2020	20.2314	20.2292	20.1469	19.8196	19.3745	19.0002 (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	0.9747	0.9633	0.9376	0.8741	0.7506	0.5627	0.3969	0.4439	0.6944	0.8942	0.9598	0.9782	(94)
Useful gains	634.6253	681.1473	713.7051	719.5512	650.8039	479.1271	321.8426	336.3025	488.1206	580.9123	597.1944	610.2688	(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	1369.7651	1324.2167	1196.8782	993.3432	760.3232	502.9905	326.0506	342.9996	545.5993	838.3483	1122.2423	1360.8478	(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	546.9441	432.1426	359.4808	197.1302	81.4824	0.0000	0.0000	0.0000	0.0000	191.5324	378.0345	558.4308	(98)
Space heating												2745.1778	(98)
Space heating per m2											(98) / (4) =	32.4950	(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													3026.6569	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	546.9441	432.1426	359.4808	197.1302	81.4824	0.0000	0.0000	0.0000	0.0000	191.5324	378.0345	558.4308	(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)	603.0254	476.4527	396.3404	217.3432	89.8372	0.0000	0.0000	0.0000	0.0000	211.1713	416.7966	615.6899	(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	90.0597	90.0819	90.0921	90.0831	89.9709	87.9000	87.9000	87.9000	87.9000	89.7140	89.9462	90.0725	(217)	
Fuel for water heating, kWh/month	174.5083	131.6998	107.2469	59.9308	30.9035	14.6549	8.9734	40.8276	65.5730	112.4695	150.0570	173.5415	(219)	
Water heating fuel used												1070.3862	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3026.6569	(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													3976.5007	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3026.6569	3.4800	105.3277	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1070.3862	3.4800	37.2494	(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			246.6776	(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] =	0.8002	(257)
SAP value			88.8378	
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	3026.6569	0.2160	653.7579	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1070.3862	0.2160	231.2034	(264)
Space and water heating			884.9613	(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			822.3998	(272)
CO2 emissions per m2			9.7300	(273)
EI value			91.4889	
EI rating			91	(274)
EI band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2400 (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					4.6800
Infiltration rate					0.4211 (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) =		0.3580 (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	0.3759	0.3490	0.3580	0.3401	0.3401	0.3311	0.3222	0.3132	0.3043	0.3311	0.3132	0.3311 (22b)
Effective ac	0.5706	0.5609	0.5641	0.5578	0.5578	0.5548	0.5519	0.5491	0.5463	0.5548	0.5491	0.5548 (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	70.0000	3086.3000 (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) = 15608.8056 (34)
184.7633 (35)
5.9830 (36)
(33) + (36) = 50.4426 (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	40.2486	39.5623	39.7854	39.3448	39.3448	39.1330	38.9268	38.7262	38.5313	39.1330	38.7262	39.1330 (38)
Heat transfer coeff	90.6912	90.0049	90.2280	89.7874	89.7874	89.5755	89.3693	89.1688	88.9739	89.5755	89.1688	89.5755 (39)
Average = Sum(39)m / 12 =												89.6589 (39)
HLP	1.0735	1.0654	1.0680	1.0628	1.0628	1.0603	1.0579	1.0555	1.0532	1.0603	1.0555	1.0603 (40)
HLP (average)												1.0613 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.5424 (42)
94.5818 (43)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF 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			
Northeast				0.9900	14.6176	0.6300	0.7000	0.7700	4.4227 (75)			
Southeast				3.5300	45.1778	0.6300	0.7000	0.7700	48.7385 (77)			
Northwest				8.1800	14.6176	0.6300	0.7000	0.7700	36.5429 (81)			
Solar gains	89.7040	142.0860	227.9539	337.2869	404.2113	457.0995	428.5196	367.1255	279.5659	178.6890	109.6674	73.8217 (83)
Total gains	669.5009	717.2192	780.6944	855.4148	886.9252	908.2099	861.2771	808.5106	740.9849	674.9365	644.5376	637.8850 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.8081	48.1727	48.0536	48.2894	48.2894	48.4036	48.5153	48.6244	48.7309	48.4036	48.6244	48.4036
alpha	4.1872	4.2115	4.2036	4.2193	4.2193	4.2269	4.2344	4.2416	4.2487	4.2269	4.2416	4.2269
util living area	0.9789	0.9708	0.9450	0.8760	0.7433	0.5395	0.3994	0.4232	0.6833	0.8924	0.9623	0.9816 (86)
MIT	19.8527	19.9762	20.2499	20.5953	20.8515	20.9705	20.9935	20.9920	20.9223	20.6316	20.2157	19.8459 (87)
Th 2	20.0225	20.0292	20.0270	20.0313	20.0313	20.0334	20.0354	20.0373	20.0392	20.0334	20.0373	20.0334 (88)
util rest of house	0.9740	0.9640	0.9318	0.8466	0.6863	0.4567	0.3032	0.3221	0.6026	0.8594	0.9519	0.9772 (89)
MIT 2	18.9969	19.1232	19.3875	19.7149	19.9348	20.0202	20.0337	20.0352	19.9983	19.7569	19.3663	18.9990 (90)
Living area fraction									fLA = Living area / (4) =			0.2134 (91)
MIT	19.1795	19.3052	19.5716	19.9028	20.1304	20.2230	20.2385	20.2394	20.1955	19.9436	19.5476	19.1798 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1795	19.3052	19.5716	19.9028	20.1304	20.2230	20.2385	20.2394	20.1955	19.9436	19.5476	19.1798 (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	0.9685	0.9577	0.9243	0.8422	0.6926	0.4735	0.3238	0.3437	0.6166	0.8558	0.9454	0.9722	(94)
Useful gains	648.3964	686.8559	721.6291	720.4143	614.2482	430.0289	278.8478	277.8936	456.9074	577.6167	609.3275	620.1232	(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	1295.0291	1260.5395	1134.3088	934.0399	685.1150	440.9830	280.4881	279.9370	488.9588	765.2973	1038.5996	1270.1588	(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	481.0948	385.5154	307.0336	153.8104	52.7249	0.0000	0.0000	0.0000	0.0000	139.6344	309.0760	483.6265	(98)
Space heating												2312.5160	(98)
Space heating per m2											(98) / (4) =	27.3735	(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													2549.6317	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	481.0948	385.5154	307.0336	153.8104	52.7249	0.0000	0.0000	0.0000	0.0000	139.6344	309.0760	483.6265	(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)	530.4242	425.0445	338.5156	169.5815	58.1311	0.0000	0.0000	0.0000	0.0000	153.9519	340.7673	533.2155	(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	(217)m	90.0082	90.0244	90.0155	89.9668	89.6170	87.9000	87.9000	87.9000	89.5313	89.8520	90.0101	(217)	
Fuel for water heating, kWh/month	169.9825	131.9747	106.9502	58.7801	35.9622	8.7984	4.2555	33.8708	60.1566	108.2917	144.8275	170.2571	(219)	
Water heating fuel used												1034.1074	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2549.6317	(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												3385.9540	(238)	

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2549.6317	7.6100	194.0270	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1034.1074	7.6100	78.6956	(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			316.2509	(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	2549.6317	0.2160	550.7205	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1034.1074	0.2160	223.3672	(264)
Space and water heating			774.0877	(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			671.4372	(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	2549.6317	1.2200	3110.5507 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1034.1074	1.2200	1261.6110 (264)
Space and water heating			4372.1617 (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			3764.9615 (272)
Primary energy kWh/m2/year			44.5663 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 37	Issued on Date	07/03/2024
Assessment Reference	As Built	Prop Type Ref	Block H
Project	11 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.83	TER	18.48
Environmental	90 B	% DER<TER	25.14		
CO ₂ Emissions (t/year)	0.86	DFEE	42.95	TFEE	53.25
General Requirements Compliance	Pass	% DFEE<TFEE	19.34		

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 37	Issued on Date	07/03/2024
Assessment Reference	As Built	Prop Type Ref	Block H
Project	11 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.83	TER	18.48
Environmental	90 B	% DER<TER	25.14		
CO ₂ Emissions (t/year)	0.86	DFEE	42.95	TFEE	53.25
General Requirements Compliance	Pass	% DFEE<TFEE	19.34		

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 37	Issued on Date	07/03/2024
Assessment Reference	As Built	Prop Type Ref	Block H
Project	11 Fieldfare Crescent, BOTLEY, SO32 2TW		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.83	TER	18.48
Environmental	90 B	% DER<TER	25.14		
CO ₂ Emissions (t/year)	0.86	DFEE	42.95	TFEE	53.25
General Requirements Compliance	Pass	% DFEE<TFEE	19.34		

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 37	Issued on Date	07/03/2024
Assessment Reference	As Built	Prop Type Ref	Block H
Property	11 Fieldfare Crescent, BOTLEY, SO32 2TW		
SAP Rating	88 B	DER	13.83
Environmental	90 B	TER	18.48
CO ₂ Emissions (t/year)	0.86	% DER<TER	25.14
General Requirements Compliance	Pass	DFEE	42.95
		TFEE	53.25
		% DFEE<TFEE	19.34
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	18.03	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	184.76	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 on both sides, dense blocks, cavity or cavity fill	0.00	70.00	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/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.24

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.11	140.00	42.24

11.2 Internal Floors

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

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Elevation	Half Glazed Door	[1] Brick and Block	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	North East	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)	8.78	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	10.10	0.039	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	10.10	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	8.78	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.79	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	4.68	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	