



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 11, Wheatear Road
Botley, SO32 2TX

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
toby@abacusenergyuk.com

Report Issue Date: 02/01/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 20			Issued on Date	02/01/2024
Assessment Reference	As Built	Prop Type Ref	Block G		
Property	11, Wheatear Road, Botley, SO32 2TX				
SAP Rating	88 B	DER	13.08	TER	17.88
Environmental	90 B	% DER<TER	26.84		
CO ₂ Emissions (t/year)	0.81	DFEE	40.11	TFEE	49.73
General Requirements Compliance	Pass	% DFEE<TFEE	19.36		
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)	17.88	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.08	kgCO ₂ /m ²	Pass
	-4.80 (-26.8%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.73	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	40.11	kWh/m ² /yr	
	-9.6 (-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	1.18 (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	4.34 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 4000 GR4700iW 30 C NG
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

3.67 m², No overhang

Windows facing East

0.66 m², No overhang

Windows facing South

7.49 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

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.11	W/m ² K
Door U-value	1.10	W/m ² K
Thermal bridging ψ -value	0.035	W/m ² K
Photovoltaic array	0.73	kW

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.

THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 20	Issued on Date	02/01/2024
Assessment Reference	As Built	Prop Type Ref	Block G
Property	11, Wheatear Road, Botley, SO32 2TX		
SAP Rating	88 B	DER	13.08
Environmental	90 B	TER	17.88
CO ₂ Emissions (t/year)	0.81	% DER<TER	26.84
General Requirements Compliance	Pass	DFEE	40.11
		TFEE	49.73
		% DFEE<TFEE	19.36
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	0.63	0.05	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	0.071	2.75	0.20	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	3.60	0.24	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	1.51	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	7.46	0.16	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	26.70	0.43	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.062	18.70	1.16	BE-E5-23902
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.70	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	13.85	0.83	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	4.85	0.21	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	15.18	0.59	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.036	5.06	0.18	Knauf P25 Halved
External wall	E25 Staggered party wall between dwellings	Independently assessed	0.055	5.06	0.28	Knauf P27 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.47	1.36	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.47	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.47	0.30	Knauf P29 Halved

Total: **6.20** W/mK:
Y-Value: **0.035** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP 0645 Plot 20			Issued on Date	02/01/2024
Assessment Reference	As Built	Prop Type Ref	Block G		
Property	11, Wheatear Road, Botley, SO32 2TX				
SAP Rating	88 B	DER	13.08	TER	17.88
Environmental	90 B	% DER<TER	26.84		
CO ₂ Emissions (t/year)	0.81	DFEE	40.11	TFEE	49.73
General Requirements Compliance	Pass	% DFEE<TFEE	19.36		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

End-Terrace House, total floor area 84 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.88 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.08 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.1 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	1.18 (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: 4.34 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 4000 GR4700iW 30 C NG
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading: Average
Windows facing North: 3.67 m², No overhang
Windows facing East: 0.66 m², No overhang
Windows facing South: 7.49 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.11 W/m²K
Door U-value 1.10 W/m²K
Thermal bridging y-value 0.035 W/m²K
Photovoltaic array 0.73 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	42.2000 (1b)	x 2.4000 (2b)	= 101.2800 (1b) - (3b)
First floor	42.2000 (1c)	x 2.6700 (2c)	= 112.6740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.9540 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1402 (8)
Pressure test					Yes
Measured/design AP50					4.3400
Infiltration rate					0.3572 (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) =	0.3036 (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	0.3871	0.3795	0.3720	0.3340	0.3264	0.2885	0.2885	0.2809	0.3036	0.3264	0.3416	0.3568 (22b)
Effective ac	0.5749	0.5720	0.5692	0.5558	0.5533	0.5416	0.5416	0.5394	0.5461	0.5533	0.5583	0.5636 (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)			11.8200	1.1450	13.5344		(27)
Ground Floor			42.2000	0.1100	4.6420	140.0000	5908.0000 (28a)
Brick and Block	94.8100	13.9400	80.8700	0.2400	19.4088	42.2200	3414.3314 (29a)
Pitched Roof	42.2000		42.2000	0.1000	4.2200	9.0000	379.8000 (30)
Total net area of external elements Aum(A, m ²)			179.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1372		(33)
Party Wall 1			42.8600	0.0000	0.0000	110.0000	4714.6000 (32)
Ground Floor Stud			66.6800			9.0000	600.1200 (32c)
First Floor Stud			92.4800			9.0000	832.3200 (32c)
Internal Floor 1			42.2000			18.0000	759.6000 (32d)
Internal Ceiling 1			42.2000			18.0000	759.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17368.3714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 205.7864 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1997 (36)
Total fabric heat loss (33) + (36) = 50.3369 (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	40.5933	40.3878	40.1864	39.2406	39.0636	38.2397	38.2397	38.0872	38.5571	39.0636	39.4216	39.7959 (38)
Heat transfer coeff	90.9302	90.7247	90.5233	89.5774	89.4005	88.5766	88.5766	88.4241	88.8940	89.4005	89.7585	90.1328 (39)
Average = Sum(39)m / 12 =												89.5766 (39)
HLP	1.0774	1.0749	1.0726	1.0613	1.0592	1.0495	1.0495	1.0477	1.0532	1.0592	1.0635	1.0679 (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												2.5411 (42)
Average daily hot water use (litres/day)												94.5503 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0054	100.2234	96.4413	92.6593	88.8773	85.0953	85.0953	88.8773	92.6593	96.4413	100.2234	104.0054 (44)
Energy conte	154.2370	134.8966	139.2012	121.3590	116.4469	100.4848	93.1139	106.8496	108.1257	126.0101	137.5499	149.3703 (45)
Energy content (annual)										Total = Sum(45)m =		1487.6450 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1355	20.2345	20.8802	18.2039	17.4670	15.0727	13.9671	16.0274	16.2189	18.9015	20.6325	22.4055 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	28.4496	25.6947	28.4416	27.5172	28.4293	27.5064	28.4196	28.4259	27.5123	28.4366	27.5272	28.4477 (61)
Total heat required for water heating calculated for each month	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179 (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	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179 (64)
Heat gains from water heating, kWh/month	58.3962	51.2768	53.3948	47.2312	45.8259	40.2878	38.0653	42.6340	42.8299	49.0075	52.6171	56.7775 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1822.4531 (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	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.8422	19.4000	15.7772	11.9443	8.9285	7.5378	8.1449	10.5871	14.2099	18.0428	21.0586	22.4492 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3904	230.7604	224.7881	212.0739	196.0244	180.9402	170.8630	168.4930	174.4653	187.1795	203.2290	218.3132 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053 (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)	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427 (71)
Water heating gains (Table 5)	78.4895	76.3048	71.7672	65.5988	61.5940	55.9553	51.1630	57.3037	59.4859	65.8703	73.0794	76.3139 (72)
Total internal gains	392.8381	390.5812	376.4485	353.7331	330.6629	308.5493	294.2869	300.4998	312.2771	335.2086	361.4829	381.1924 (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			
North				3.6700	10.6334	0.6300	0.7000	0.7700	11.9264 (74)			
East				0.6600	19.6403	0.6300	0.7000	0.7700	3.9615 (76)			
South				7.4900	46.7521	0.6300	0.7000	0.7700	107.0174 (78)			
Solar gains	122.9054	205.8085	274.7506	333.1534	369.5571	366.1115	353.2325	325.6551	294.6287	225.3683	146.5045	105.6731 (83)
Total gains	515.7435	596.3897	651.1991	686.8864	700.2200	674.6608	647.5194	626.1549	606.9058	560.5768	507.9874	486.8655 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	53.0577	53.1779	53.2962	53.8590	53.9656	54.4675	54.4675	54.5615	54.2731	53.9656	53.7503	53.5271
alpha	4.5372	4.5452	4.5531	4.5906	4.5977	4.6312	4.6312	4.6374	4.6182	4.5977	4.5834	4.5685
util living area	0.9951	0.9898	0.9789	0.9511	0.8840	0.7443	0.5777	0.6158	0.8263	0.9588	0.9903	0.9962 (86)
MIT	19.6792	19.8559	20.1120	20.4323	20.7198	20.9144	20.9793	20.9721	20.8523	20.4826	20.0188	19.6450 (87)
Th 2	20.0194	20.0214	20.0233	20.0325	20.0343	20.0423	20.0423	20.0438	20.0392	20.0343	20.0308	20.0271 (88)
util rest of house	0.9937	0.9871	0.9727	0.9358	0.8459	0.6639	0.4632	0.5028	0.7604	0.9429	0.9871	0.9951 (89)
MIT 2	18.8148	18.9918	19.2464	19.5653	19.8327	19.9971	20.0357	20.0341	19.9514	19.6190	19.1621	18.7869 (90)
Living area fraction									fLA = Living area / (4) =			0.2153 (91)
MIT	19.0009	19.1779	19.4328	19.7519	20.0237	20.1946	20.2388	20.2360	20.1454	19.8049	19.3465	18.9717 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0009	19.1779	19.4328	19.7519	20.0237	20.1946	20.2388	20.2360	20.1454	19.8049	19.3465	18.9717 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9918	0.9839	0.9681	0.9304	0.8454	0.6778	0.4877	0.5268	0.7687	0.9382	0.9841	0.9936 (94)
Ext temp.	511.5138	586.7860	630.3989	639.1067	591.9635	457.3037	315.7882	329.8434	466.5096	525.9472	499.9355	483.7369 (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	1336.7518	1295.3539	1170.7170	972.0871	744.1434	495.5531	322.3150	339.1949	537.3962	822.9237	1099.2312	1331.4110 (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	613.9771	476.1576	401.9967	239.7458	113.2219	0.0000	0.0000	0.0000	0.0000	220.9505	431.4929	630.6695 (98)
Space heating per m2												3128.2121 (98)
										(98) / (4) =		37.0641 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3468.0843 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	613.9771	476.1576	401.9967	239.7458	113.2219	0.0000	0.0000	0.0000	0.0000	220.9505	431.4929	630.6695	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	680.6841	527.8909	445.6726	265.7936	125.5232	0.0000	0.0000	0.0000	0.0000	244.9562	478.3735	699.1902	(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	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179	(64)
Efficiency of water heater (217)m	89.5902	89.5298	89.4189	89.1859	88.7219	87.6000	87.6000	87.6000	87.6000	89.1118	89.4652	87.6000	(216)
Fuel for water heating, kWh/month	203.9135	179.3719	187.4803	166.9279	163.2925	146.1087	138.7369	154.4241	154.8379	173.3178	184.5154	198.4243	(219)
Water heating fuel used												2051.3511	(219)
Annual totals kWh/year													
Space heating fuel - main system												3468.0843	(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)												385.7398	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424		-630.4424	(233)
Total delivered energy for all uses												5349.7328	(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	3468.0843	0.2160	749.1062 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2051.3511	0.2160	443.0918 (264)
Space and water heating			1192.1980 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	385.7398	0.5190	200.1989 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total CO2, kg/year			1104.1224 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.0800 (273)

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

DER		13.0800	ZC1
Total Floor Area		84.4000	
Assumed number of occupants	TFA	2.5411	N
CO2 emission factor in Table 12 for electricity displaced from grid	N	0.5190	EF
CO2 emissions from appliances, equation (L14)		16.0355	ZC2
CO2 emissions from cooking, equation (L16)		2.1325	ZC3
Total CO2 emissions		31.2480	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		31.2480	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	42.2000 (1b)	x 2.4000 (2b)	= 101.2800 (1b) - (3b)
First floor	42.2000 (1c)	x 2.6700 (2c)	= 112.6740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.9540 (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) = 0.1402 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3902 (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) =				0.3317 (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	0.4229	0.4146	0.4063	0.3649	0.3566	0.3151	0.3151	0.3068	0.3317	0.3566	0.3731	0.3897 (22b)
Effective ac	0.5894	0.5859	0.5825	0.5666	0.5636	0.5496	0.5496	0.5471	0.5550	0.5636	0.5696	0.5759 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Semi-glazed door			2.1200	1.2000	2.5440		(26a)
TER Opening Type (Uw = 1.40)			11.8200	1.3258	15.6705		(27)
Ground Floor			42.2000	0.1300	5.4860		(28a)
Brick and Block	94.8100	13.9400	80.8700	0.1800	14.5566		(29a)
Pitched Roof	42.2000		42.2000	0.1300	5.4860		(30)
Total net area of external elements Aum(A, m ²)			179.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.7431		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9889 (36)
Total fabric heat loss						(33) + (36) =	53.7320 (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	41.6160	41.3708	41.1305	40.0018	39.7906	38.8075	38.8075	38.6255	39.1862	39.7906	40.2178	40.6645 (38)
Heat transfer coeff	95.3479	95.1028	94.8625	93.7337	93.5226	92.5395	92.5395	92.3574	92.9181	93.5226	93.9498	94.3964 (39)
Average = Sum(39)m / 12 =												93.7327 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1297	1.1268	1.1240	1.1106	1.1081	1.0964	1.0964	1.0943	1.1009	1.1081	1.1131	1.1184 (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												2.5411 (42)
Average daily hot water use (litres/day)												94.5503 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0054	100.2234	96.4413	92.6593	88.8773	85.0953	85.0953	88.8773	92.6593	96.4413	100.2234	104.0054 (44)
Energy conte	154.2370	134.8966	139.2012	121.3590	116.4469	100.4848	93.1139	106.8496	108.1257	126.0101	137.5499	149.3703 (45)
Energy content (annual)										Total = Sum(45)m =		1487.6450 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1355	20.2345	20.8802	18.2039	17.4670	15.0727	13.9671	16.0274	16.2189	18.9015	20.6325	22.4055 (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	49.1455	45.6950	45.2909	41.9648	43.3636	45.2909	45.6950	49.1455	49.3151	50.9589 (61)
Solar input	205.1959	180.9240	188.3467	167.0540	161.7378	142.4496	136.4776	152.1405	153.8207	175.1555	186.8649	200.3292 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	205.1959	180.9240	188.3467	167.0540	161.7378	142.4496	136.4776	152.1405	153.8207	175.1555	186.8649	200.3292 (64)
	64.0235	56.3600	58.5708	51.7756	50.0413	43.9024	41.8013	46.8502	47.3756	54.1847	58.0641	62.4053 (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	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.8422	19.4000	15.7772	11.9443	8.9285	7.5378	8.1449	10.5871	14.2099	18.0428	21.0586	22.4492	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3904	230.7604	224.7881	212.0739	196.0244	180.9402	170.8630	168.4930	174.4653	187.1795	203.2290	218.3132	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	(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)	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	(71)
Water heating gains (Table 5)	86.0531	83.8690	78.7242	71.9106	67.2598	60.9755	56.1845	62.9707	65.7994	72.8289	80.6446	83.8781	(72)
Total internal gains	400.4017	398.1454	383.4055	360.0448	336.3288	313.5696	299.3084	306.1668	318.5906	342.1672	369.0481	388.7566	(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	
North					3.6700	10.6334	0.6300	0.7000			0.7700	11.9264 (74)	
East					0.6600	19.6403	0.6300	0.7000			0.7700	3.9615 (76)	
South					7.4900	46.7521	0.6300	0.7000			0.7700	107.0174 (78)	
Solar gains	122.9054	205.8085	274.7506	333.1534	369.5571	366.1115	353.2325	325.6551	294.6287	225.3683	146.5045	105.6731	(83)
Total gains	523.3071	603.9540	658.1561	693.1982	705.8859	679.6811	652.5409	631.8219	613.2192	567.5355	515.5526	494.4297	(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	61.4708	61.6292	61.7854	62.5294	62.6706	63.3363	63.3363	63.4612	63.0782	62.6706	62.3856	62.0904	
alpha	5.0981	5.1086	5.1190	5.1686	5.1780	5.2224	5.2224	5.2307	5.2052	5.1780	5.1590	5.1394	
util living area	0.9977	0.9948	0.9879	0.9679	0.9118	0.7765	0.6029	0.6422	0.8569	0.9735	0.9950	0.9983	(86)
MIT	19.8047	19.9603	20.1891	20.4808	20.7464	20.9275	20.9845	20.9786	20.8701	20.5289	20.1117	19.7775	(87)
Th 2	19.9766	19.9790	19.9813	19.9922	19.9942	20.0037	20.0037	20.0055	20.0001	19.9942	19.9901	19.9858	(88)
util rest of house	0.9969	0.9930	0.9835	0.9553	0.8749	0.6898	0.4771	0.5181	0.7885	0.9605	0.9930	0.9977	(89)
MIT 2	18.3849	18.6134	18.9471	19.3725	19.7346	19.9523	19.9977	19.9962	19.8936	19.4466	18.8430	18.3518	(90)
Living area fraction	18.6906	18.9034	19.2145	19.6111	19.9524	20.1623	20.2101	20.2077	20.1039	19.6796	19.1161	18.6587	(92)
MIT	18.6906	18.9034	19.2145	19.6111	19.9524	20.1623	20.2101	20.2077	20.1039	19.6796	19.1161	18.6587	(93)
Temperature adjustment													
adjusted MIT	18.6906	18.9034	19.2145	19.6111	19.9524	20.1623	20.2101	20.2077	20.1039	19.6796	19.1161	18.6587	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	520.9237	598.0972	644.3566	657.9840	616.3122	479.1731	329.0620	344.2004	488.5584	542.0571	510.6010	492.7188	(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	1372.1108	1331.7627	1206.1268	1003.9950	771.7878	514.7302	334.0813	351.6711	557.8678	849.1468	1128.9144	1364.8519	(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	633.2832	493.0232	417.9570	249.1280	115.6738	0.0000	0.0000	0.0000	0.0000	228.4747	445.1857	648.8671	(98)
Space heating												3231.5928	(98)
Space heating per m2												38.2890	(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													3459.9494 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	633.2832	493.0232	417.9570	249.1280	115.6738	0.0000	0.0000	0.0000	0.0000	228.4747	445.1857	648.8671	(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)	678.0334	527.8621	447.4915	266.7323	123.8478	0.0000	0.0000	0.0000	0.0000	244.6196	476.6442	694.7185	(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	205.1959	180.9240	188.3467	167.0540	161.7378	142.4496	136.4776	152.1405	153.8207	175.1555	186.8649	200.3292	(64)
Efficiency of water heater (217)m	87.7005	87.4473	87.0006	86.0553	84.2237	80.3000	80.3000	80.3000	80.3000	85.7212	87.1589	80.3000	(216)
Fuel for water heating, kWh/month	233.9734	206.8950	216.4888	194.1240	192.0335	177.3968	169.9596	189.4651	191.5576	204.3317	214.3957	228.1784	(219)
Water heating fuel used												2418.7996	(219)
Annual totals kWh/year													
Space heating fuel - main system												3459.9494	(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)												385.7398	(232)
Total delivered energy for all uses												6339.4888	(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	3459.9494	0.2160	747.3491 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2418.7996	0.2160	522.4607 (264)
Space and water heating			1269.8098 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	385.7398	0.5190	200.1989 (268)
Total CO2, kg/m2/year			1508.9337 (272)
Emissions per m2 for space and water heating			15.0451 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3720 (272b)
Emissions per m2 for pumps and fans			0.4612 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.0451 * 1.00) + 2.3720 + 0.4612, rounded to 2 d.p.			17.8800 (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	42.2000 (1b)	x 2.4000 (2b)	= 101.2800 (1b) - (3b)
First floor	42.2000 (1c)	x 2.6700 (2c)	= 112.6740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.9540 (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) = 0.1402 (8)
Pressure test					Yes
Measured/design AP50					4.3400
Infiltration rate					0.3572 (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) =		0.3036 (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	0.3871	0.3795	0.3720	0.3340	0.3264	0.2885	0.2885	0.2809	0.3036	0.3264	0.3416	0.3568 (22b)
Effective ac	0.5749	0.5720	0.5692	0.5558	0.5533	0.5416	0.5416	0.5394	0.5461	0.5533	0.5583	0.5636 (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)			11.8200	1.1450	13.5344		(27)
Ground Floor			42.2000	0.1100	4.6420	140.0000	5908.0000 (28a)
Brick and Block	94.8100	13.9400	80.8700	0.2400	19.4088	42.2200	3414.3314 (29a)
Pitched Roof	42.2000		42.2000	0.1000	4.2200	9.0000	379.8000 (30)
Total net area of external elements Aum(A, m ²)			179.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1372		(33)
Party Wall 1			42.8600	0.0000	0.0000	110.0000	4714.6000 (32)
Ground Floor Stud			66.6800			9.0000	600.1200 (32c)
First Floor Stud			92.4800			9.0000	832.3200 (32c)
Internal Floor 1			42.2000			18.0000	759.6000 (32d)
Internal Ceiling 1			42.2000			9.0000	379.8000 (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) = 16988.5714 (34)
201.2864 (35)
6.1997 (36)
(33) + (36) = 50.3369 (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	40.5933	40.3878	40.1864	39.2406	39.0636	38.2397	38.2397	38.0872	38.5571	39.0636	39.4216	39.7959 (38)
Heat transfer coeff	90.9302	90.7247	90.5233	89.5774	89.4005	88.5766	88.5766	88.4241	88.8940	89.4005	89.7585	90.1328 (39)
Average = Sum(39)m / 12 =												89.5766 (39)
HLP	1.0774	1.0749	1.0726	1.0613	1.0592	1.0495	1.0495	1.0477	1.0532	1.0592	1.0635	1.0679 (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												2.5411 (42)
Average daily hot water use (litres/day)												94.5503 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0054	100.2234	96.4413	92.6593	88.8773	85.0953	85.0953	88.8773	92.6593	96.4413	100.2234	104.0054 (44)
Energy conte	154.2370	134.8966	139.2012	121.3590	116.4469	100.4848	93.1139	106.8496	108.1257	126.0101	137.5499	149.3703 (45)
Energy content (annual)										Total = Sum(45)m =		1487.6450 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	32.7754	28.6655	29.5803	25.7888	24.7450	21.3530	19.7867	22.7055	22.9767	26.7771	29.2293	31.7412 (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	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.8422	19.4000	15.7772	11.9443	8.9285	7.5378	8.1449	10.5871	14.2099	18.0428	21.0586	22.4492	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3904	230.7604	224.7881	212.0739	196.0244	180.9402	170.8630	168.4930	174.4653	187.1795	203.2290	218.3132	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	(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)	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	(71)
Water heating gains (Table 5)	44.0529	42.6570	39.7584	35.8178	33.2594	29.6570	26.5950	30.5182	31.9121	35.9908	40.5963	42.6629	(72)
Total internal gains	355.4015	353.9335	341.4397	320.9520	299.3283	279.2510	266.7189	270.7143	281.7033	302.3291	325.9999	344.5414	(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
North					3.6700	10.6334	0.6300	0.7000			0.7700	11.9264 (74)
East					0.6600	19.6403	0.6300	0.7000			0.7700	3.9615 (76)
South					7.4900	46.7521	0.6300	0.7000			0.7700	107.0174 (78)
Solar gains	122.9054	205.8085	274.7506	333.1534	369.5571	366.1115	353.2325	325.6551	294.6287	225.3683	146.5045	105.6731 (83)
Total gains	478.3068	559.7420	616.1903	654.1054	668.8854	645.3625	619.9514	596.3694	576.3320	527.6973	472.5043	450.2145 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.8975	52.0150	52.1307	52.6812	52.7855	53.2764	53.2764	53.3684	53.0863	52.7855	52.5750	52.3566	
alpha	4.4598	4.4677	4.4754	4.5121	4.5190	4.5518	4.5518	4.5579	4.5391	4.5190	4.5050	4.4904	
util living area	0.9960	0.9915	0.9817	0.9567	0.8953	0.7630	0.5981	0.6390	0.8440	0.9650	0.9921	0.9970	(86)
MIT	19.6074	19.7891	20.0534	20.3857	20.6880	20.8999	20.9745	20.9655	20.8295	20.4358	19.9561	19.5734	(87)
Th 2	20.0194	20.0214	20.0233	20.0325	20.0343	20.0423	20.0423	20.0438	20.0392	20.0343	20.0308	20.0271	(88)
util rest of house	0.9949	0.9891	0.9764	0.9431	0.8600	0.6845	0.4817	0.5248	0.7818	0.9514	0.9896	0.9961	(89)
MIT 2	18.7453	18.9274	19.1906	19.5225	19.8064	19.9881	20.0339	20.0313	19.9352	19.5763	19.1018	18.7175	(90)
Living area fraction	18.9309	19.1129	19.3764	19.7084	19.9962	20.1844	20.2364	20.2324	20.1278	19.7613	19.2857	18.9017	(91)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(92)
adjusted MIT	18.9309	19.1129	19.3764	19.7084	19.9962	20.1844	20.2364	20.2324	20.1278	19.7613	19.2857	18.9017	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	475.0971	552.0487	598.9098	613.2357	574.1667	450.0304	314.0302	327.2486	454.3753	499.4540	466.3258	447.8755	(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	1330.3879	1289.4628	1165.6103	968.1846	741.6846	494.6475	322.1002	338.8807	535.8316	819.0251	1093.7727	1325.1076	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	636.3363	495.5423	421.6252	255.5632	124.6333	0.0000	0.0000	0.0000	0.0000	237.7609	451.7618	652.6607	(98)
Space heating												3275.8838	(98)
Space heating per m2												38.8138	(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	832.6203	655.4670	672.0229	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8283	0.8977	0.8806	0.0000	0.0000	0.0000	0.0000	(101)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	689.6465	588.4242	591.7902	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	850.0929	818.4546	792.7126	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	115.5214	171.1427	149.4863	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												436.1503 (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	28.8803	42.7857	37.3716	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												109.0376 (107)
Space cooling per m2												1.2919 (108)
Energy for space heating												38.8138 (99)
Energy for space cooling												1.2919 (108)
Total												40.1057 (109)
Dwelling Fabric Energy Efficiency (DFEE)												40.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2000 (1b)	x 2.4000 (2b)	= 101.2800 (1b) - (3b)
First floor	42.2000 (1c)	x 2.6700 (2c)	= 112.6740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.9540 (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) =	0.1402 (8)	
Pressure test												Yes		
Measured/design AP50												5.0000		
Infiltration rate												0.3902 (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) =	0.3317 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind factor	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)		
Adj infilt rate	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)		
	0.4229	0.4146	0.4063	0.3649	0.3566	0.3151	0.3151	0.3068	0.3317	0.3566	0.3731	0.3897 (22b)		
Effective ac	0.5894	0.5859	0.5825	0.5666	0.5636	0.5496	0.5496	0.5471	0.5550	0.5636	0.5696	0.5759 (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)			11.8200	1.3258	15.6705			(27)					
Ground Floor			42.2000	0.1300	5.4860			(28a)					
Brick and Block	94.8100	13.9400	80.8700	0.1800	14.5566			(29a)					
Pitched Roof	42.2000		42.2000	0.1300	5.4860			(30)					
Total net area of external elements Aum(A, m2)			179.2100					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	43.7431			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.9889 (36)					
Total fabric heat loss						(33) + (36) =		53.7320 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 41.6160	Feb 41.3708	Mar 41.1305	Apr 40.0018	May 39.7906	Jun 38.8075	Jul 38.8075	Aug 38.6255	Sep 39.1862	Oct 39.7906	Nov 40.2178	Dec 40.6645	(38)
Heat transfer coeff	95.3479	95.1028	94.8625	93.7337	93.5226	92.5395	92.5395	92.3574	92.9181	93.5226	93.9498	94.3964	(39)
Average = Sum(39)m / 12 =												93.7327	(39)
HLP	Jan 1.1297	Feb 1.1268	Mar 1.1240	Apr 1.1106	May 1.1081	Jun 1.0964	Jul 1.0964	Aug 1.0943	Sep 1.1009	Oct 1.1081	Nov 1.1131	Dec 1.1184	(40)
HLP (average)												1.1106	(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												2.5411 (42)
Average daily hot water use (litres/day)												94.5503 (43)
Daily hot water use	Jan 104.0054	Feb 100.2234	Mar 96.4413	Apr 92.6593	May 88.8773	Jun 85.0953	Jul 85.0953	Aug 88.8773	Sep 92.6593	Oct 96.4413	Nov 100.2234	Dec 104.0054 (44)
Energy conte	154.2370	134.8966	139.2012	121.3590	116.4469	100.4848	93.1139	106.8496	108.1257	126.0101	137.5499	149.3703 (45)
Energy content (annual)										Total = Sum(45)m =		1487.6450 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000 (59)
	32.7754	28.6655	29.5803	25.7888	24.7450	21.3530	19.7867	22.7055	22.9767	26.7771	29.2293	31.7412	(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	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	127.0533	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.8422	19.4000	15.7772	11.9443	8.9285	7.5378	8.1449	10.5871	14.2099	18.0428	21.0586	22.4492	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3904	230.7604	224.7881	212.0739	196.0244	180.9402	170.8630	168.4930	174.4653	187.1795	203.2290	218.3132	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	35.7053	(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)	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	(71)
Water heating gains (Table 5)	44.0529	42.6570	39.7584	35.8178	33.2594	29.6570	26.5950	30.5182	31.9121	35.9908	40.5963	42.6629	(72)
Total internal gains	355.4015	353.9335	341.4397	320.9520	299.3283	279.2510	266.7189	270.7143	281.7033	302.3291	325.9999	344.5414	(73)

6. Solar gains													

[Jan]			Area	Solar flux		g	FF		Access		Gains		
			m2	Table 6a		Specific data	Specific data		factor		W		
				W/m2		or Table 6b	or Table 6c		Table 6d				
North			3.6700	10.6334		0.6300	0.7000		0.7700		11.9264		(74)
East			0.6600	19.6403		0.6300	0.7000		0.7700		3.9615		(76)
South			7.4900	46.7521		0.6300	0.7000		0.7700		107.0174		(78)

Solar gains	122.9054	205.8085	274.7506	333.1534	369.5571	366.1115	353.2325	325.6551	294.6287	225.3683	146.5045	105.6731	(83)
Total gains	478.3068	559.7420	616.1903	654.1054	668.8854	645.3625	619.9514	596.3694	576.3320	527.6973	472.5043	450.2145	(84)

7. Mean internal temperature (heating season)													

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	61.4708	61.6292	61.7854	62.5294	62.6706	63.3363	63.3363	63.4612	63.0782	62.6706	62.3856	62.0904	
util living area	5.0981	5.1086	5.1190	5.1686	5.1780	5.2224	5.2224	5.2307	5.2052	5.1780	5.1590	5.1394	
	0.9985	0.9963	0.9909	0.9745	0.9261	0.8012	0.6297	0.6728	0.8800	0.9803	0.9966	0.9989	(86)
MIT	19.7550	19.9121	20.1448	20.4433	20.7193	20.9155	20.9811	20.9735	20.8496	20.4894	20.0646	19.7284	(87)
Th 2	19.9766	19.9790	19.9813	19.9922	19.9942	20.0037	20.0037	20.0055	20.0001	19.9942	19.9901	19.9858	(88)
util rest of house													
	0.9980	0.9950	0.9875	0.9641	0.8934	0.7170	0.5007	0.5464	0.8172	0.9702	0.9952	0.9985	(89)
MIT 2	18.8403	18.9989	19.2318	19.5337	19.7945	19.9618	19.9986	19.9974	19.9133	19.5832	19.1602	18.8212	(90)
Living area fraction													
MIT	19.0372	19.1955	19.4284	19.7295	19.9936	20.1671	20.2101	20.2076	20.1149	19.7783	19.3549	19.0165	(91)
Temperature adjustment													
adjusted MIT	19.0372	19.1955	19.4284	19.7295	19.9936	20.1671	20.2101	20.2076	20.1149	19.7783	19.3549	19.0165	(92)
													0.0000
													19.0165 (93)

8. Space heating requirement													

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9973	0.9937	0.9851	0.9607	0.8933	0.7324	0.5288	0.5738	0.8257	0.9674	0.9940	0.9980	(94)
Ext temp.	477.0079	556.1888	607.0100	628.3993	597.5400	472.6739	327.8449	342.1993	475.8690	510.4754	469.6778	449.3127	(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	1405.1651	1359.5389	1226.4151	1015.0923	775.6380	515.1762	334.0789	351.6578	558.8923	858.3751	1151.3488	1398.6263	(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 per m2	690.5490	539.8513	460.8374	278.4190	132.5049	0.0000	0.0000	0.0000	0.0000	258.8374	490.8031	706.2893	(98)
												3558.0914	(98)
													(98) / (4) =
													42.1575 (99)

8c. Space cooling requirement													

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	869.8711	684.7921	701.9164	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8295	0.9040	0.8859	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	721.5453	619.0381	621.8417	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	850.0929	818.4546	792.7126	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	92.5542	148.3659	127.1280	0.0000	0.0000	0.0000	0.0000	(104)
													368.0482 (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	23.1386	37.0915	31.7820	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												92.0120 (107)
Space cooling per m2												1.0902 (108)
Energy for space heating												42.1575 (99)
Energy for space cooling												1.0902 (108)
Total												43.2477 (109)
Target Fabric Energy Efficiency (TFEE)												49.7 (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	42.2000 (1b)	x 2.4000 (2b)	= 101.2800 (1b) - (3b)
First floor	42.2000 (1c)	x 2.6700 (2c)	= 112.6740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.9540 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1402 (8)
Pressure test					Yes
Measured/design AP50					4.3400
Infiltration rate					0.3572 (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) =	0.3036 (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												
Effective ac	0.3188	0.2960	0.3036	0.2885	0.2885	0.2809	0.2733	0.2657	0.2581	0.2809	0.2657	0.2809 (22b)
	0.5508	0.5438	0.5461	0.5416	0.5416	0.5394	0.5373	0.5353	0.5333	0.5394	0.5353	0.5394 (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)			11.8200	1.1450	13.5344		(27)
Ground Floor			42.2000	0.1100	4.6420	140.0000	5908.0000 (28a)
Brick and Block	94.8100	13.9400	80.8700	0.2400	19.4088	42.2200	3414.3314 (29a)
Pitched Roof	42.2000		42.2000	0.1000	4.2200	9.0000	379.8000 (30)
Total net area of external elements Aum(A, m ²)			179.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1372		(33)
Party Wall 1			42.8600	0.0000	0.0000	110.0000	4714.6000 (32)
Ground Floor Stud			66.6800			9.0000	600.1200 (32c)
First Floor Stud			92.4800			9.0000	832.3200 (32c)
Internal Floor 1			42.2000			18.0000	759.6000 (32d)
Internal Ceiling 1			42.2000			18.0000	759.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17368.3714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 205.7864 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1997 (36)
Total fabric heat loss (33) + (36) = 50.3369 (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	38.8907	38.3964	38.5571	38.2397	38.2397	38.0872	37.9387	37.7943	37.6539	38.0872	37.7943	38.0872 (38)
Heat transfer coeff	89.2276	88.7333	88.8940	88.5766	88.5766	88.4241	88.2756	88.1311	87.9908	88.4241	88.1311	88.4241 (39)
Average = Sum(39)m / 12 =												88.4841 (39)
HLP	1.0572	1.0513	1.0532	1.0495	1.0495	1.0477	1.0459	1.0442	1.0425	1.0477	1.0442	1.0477 (40)
HLP (average)												1.0484 (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												2.5411 (42)
Average daily hot water use (litres/day)												94.5503 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0054	100.2234	96.4413	92.6593	88.8773	85.0953	85.0953	88.8773	92.6593	96.4413	100.2234	104.0054 (44)
Energy conte	154.2370	134.8966	139.2012	121.3590	116.4469	100.4848	93.1139	106.8496	108.1257	126.0101	137.5499	149.3703 (45)
Energy content (annual)										Total = Sum(45)m =		1487.6450 (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	23.1355	20.2345	20.8802	18.2039	17.4670	15.0727	13.9671	16.0274	16.2189	18.9015	20.6325	22.4055 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	28.4496	25.6947	28.4416	27.5172	28.4293	27.5064	28.4196	28.4259	27.5123	28.4366	27.5272	28.4477 (61)
Total heat required for water heating calculated for each month	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179 (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	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	58.3962	51.2768	53.3948	47.2312	45.8259	40.2878	38.0653	42.6340	42.8299	49.0075	52.6171	56.7775 (65)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Total per year (kWh/year) = Sum(64)m =												1822.4531 (64)
1822 (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	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.6055	48.5001	39.4429	29.8608	22.3213	18.8446	20.3623	26.4676	35.5248	45.1069	52.6464	56.1231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.8812	344.4185	335.5047	316.5282	292.5738	270.0600	255.0194	251.4821	260.3960	279.3725	303.3269	325.8406	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	(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)	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	(71)
Water heating gains (Table 5)	78.4895	76.3048	71.7672	65.5988	61.5940	55.9553	51.1630	57.3037	59.4859	65.8703	73.0794	76.3139	(72)
Total internal gains	580.5850	575.8321	553.3236	518.5966	483.0979	451.4687	433.1535	441.8623	462.0155	496.9584	535.6614	564.8864	(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
North				3.6700	13.4839		0.6300		0.7000		0.7700	15.1235 (74)
East				0.6600	25.1925		0.6300		0.7000		0.7700	5.0815 (76)
South				7.4900	56.7559		0.6300		0.7000		0.7700	129.9165 (78)
Solar gains	150.1215	213.7918	288.3774	354.6162	377.0958	407.4557	389.3562	365.1567	327.4469	252.6609	178.3002	126.9387 (83)
Total gains	730.7065	789.6239	841.7010	873.2128	860.1937	858.9244	822.5097	807.0190	789.4624	749.6193	713.9616	691.8251 (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	54.0701	54.3714	54.2731	54.4675	54.4675	54.5615	54.6533	54.7428	54.8301	54.5615	54.7428	54.5615	
alpha	4.6047	4.6248	4.6182	4.6312	4.6312	4.6374	4.6436	4.6495	4.6553	4.6374	4.6495	4.6374	
util living area	0.9776	0.9673	0.9402	0.8794	0.7636	0.5653	0.4143	0.4212	0.6555	0.8696	0.9563	0.9811 (86)	
MIT	20.0470	20.1685	20.4015	20.6686	20.8731	20.9755	20.9953	20.9950	20.9513	20.7396	20.3757	20.0268 (87)	
Th 2	20.0359	20.0408	20.0392	20.0423	20.0423	20.0438	20.0452	20.0467	20.0480	20.0438	20.0467	20.0438 (88)	
util rest of house	0.9720	0.9592	0.9251	0.8488	0.7058	0.4792	0.3151	0.3207	0.5732	0.8305	0.9436	0.9763 (89)	
MIT 2	19.1910	19.3133	19.5368	19.7878	19.9617	20.0334	20.0441	20.0455	20.0241	19.8564	19.5216	19.1779 (90)	
Living area fraction	19.3753	19.4975	19.7229	19.9774	20.1579	20.2362	20.2489	20.2499	20.2237	20.0465	19.7055	19.3607 (91)	
MIT	19.3753	19.4975	19.7229	19.9774	20.1579	20.2362	20.2489	20.2499	20.2237	20.0465	19.7055	19.3607 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3753	19.4975	19.7229	19.9774	20.1579	20.2362	20.2489	20.2499	20.2237	20.0465	19.7055	19.3607 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9671	0.9536	0.9193	0.8465	0.7133	0.4971	0.3365	0.3424	0.5892	0.8306	0.9381	0.9719 (94)
Useful gains	706.6860	753.0065	773.7613	739.1801	613.5905	426.9725	276.7742	276.3250	465.1638	622.6579	669.8020	672.3512 (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	1291.5965	1259.7861	1130.9922	928.0512	678.3124	436.4804	277.9711	277.6029	486.0363	764.5581	1040.4309	1269.8302 (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	435.1735	340.5559	265.7798	135.9872	48.1530	0.0000	0.0000	0.0000	0.0000	105.5738	266.8528	444.5244 (98)
Space heating												2042.6004 (98)
RHI space heating demand												2043 (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	42.2000 (1b)	x 2.4000 (2b)	= 101.2800 (1b) - (3b)
First floor	42.2000 (1c)	x 2.6700 (2c)	= 112.6740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.9540 (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) = 0.1402 (8)
Pressure test					Yes
Measured/design AP50					4.3400
Infiltration rate					0.3572 (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) =	0.3036 (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	0.3871	0.3795	0.3720	0.3340	0.3264	0.2885	0.2885	0.2809	0.3036	0.3264	0.3416	0.3568 (22b)
Effective ac	0.5749	0.5720	0.5692	0.5558	0.5533	0.5416	0.5416	0.5394	0.5461	0.5533	0.5583	0.5636 (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)			11.8200	1.1450	13.5344		(27)
Ground Floor			42.2000	0.1100	4.6420	140.0000	5908.0000 (28a)
Brick and Block	94.8100	13.9400	80.8700	0.2400	19.4088	42.2200	3414.3314 (29a)
Pitched Roof	42.2000		42.2000	0.1000	4.2200	9.0000	379.8000 (30)
Total net area of external elements Aum(A, m ²)			179.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1372		(33)
Party Wall 1			42.8600	0.0000	0.0000	110.0000	4714.6000 (32)
Ground Floor Stud			66.6800			9.0000	600.1200 (32c)
First Floor Stud			92.4800			9.0000	832.3200 (32c)
Internal Floor 1			42.2000			18.0000	759.6000 (32d)
Internal Ceiling 1			42.2000			18.0000	759.6000 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17368.3714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.7864 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.1997 (36)
Total fabric heat loss						(33) + (36) =	50.3369 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	40.5933	40.3878	40.1864	39.2406	39.0636	38.2397	38.2397	38.0872	38.5571	39.0636	39.4216	39.7959 (38)
Heat transfer coeff	90.9302	90.7247	90.5233	89.5774	89.4005	88.5766	88.5766	88.4241	88.8940	89.4005	89.7585	90.1328 (39)
Average = Sum(39)m / 12 =												89.5766 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0774	1.0749	1.0726	1.0613	1.0592	1.0495	1.0495	1.0477	1.0532	1.0592	1.0635	1.0679 (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												2.5411 (42)
Average daily hot water use (litres/day)												94.5503 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0054	100.2234	96.4413	92.6593	88.8773	85.0953	85.0953	88.8773	92.6593	96.4413	100.2234	104.0054 (44)
Energy conte	154.2370	134.8966	139.2012	121.3590	116.4469	100.4848	93.1139	106.8496	108.1257	126.0101	137.5499	149.3703 (45)
Energy content (annual)										Total = Sum(45)m =		1487.6450 (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	23.1355	20.2345	20.8802	18.2039	17.4670	15.0727	13.9671	16.0274	16.2189	18.9015	20.6325	22.4055 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	28.4496	25.6947	28.4416	27.5172	28.4293	27.5064	28.4196	28.4259	27.5123	28.4366	27.5272	28.4477 (61)
Total heat required for water heating calculated for each month	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179 (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	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179 (64)
Heat gains from water heating, kWh/month	58.3962	51.2768	53.3948	47.2312	45.8259	40.2878	38.0653	42.6340	42.8299	49.0075	52.6171	56.7775 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1822.4531 (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	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.6055	48.5001	39.4429	29.8608	22.3213	18.8446	20.3623	26.4676	35.5248	45.1069	52.6464	56.1231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.8812	344.4185	335.5047	316.5282	292.5738	270.0600	255.0194	251.4821	260.3960	279.3725	303.3269	325.8406	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	(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)	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	(71)
Water heating gains (Table 5)	78.4895	76.3048	71.7672	65.5988	61.5940	55.9553	51.1630	57.3037	59.4859	65.8703	73.0794	76.3139	(72)
Total internal gains	580.5850	575.8321	553.3236	518.5966	483.0979	451.4687	433.1535	441.8623	462.0155	496.9584	535.6614	564.8864	(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			
North				3.6700	10.6334	0.6300	0.7000	0.7700	11.9264 (74)			
East				0.6600	19.6403	0.6300	0.7000	0.7700	3.9615 (76)			
South				7.4900	46.7521	0.6300	0.7000	0.7700	107.0174 (78)			
Solar gains	122.9054	205.8085	274.7506	333.1534	369.5571	366.1115	353.2325	325.6551	294.6287	225.3683	146.5045	105.6731 (83)
Total gains	703.4903	781.6407	828.0742	851.7500	852.6549	817.5801	786.3860	767.5174	756.6441	722.3267	682.1659	670.5595 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.0577	53.1779	53.2962	53.8590	53.9656	54.4675	54.4675	54.5615	54.2731	53.9656	53.7503	53.5271	
alpha	4.5372	4.5452	4.5531	4.5906	4.5977	4.6312	4.6312	4.6374	4.6182	4.5977	4.5834	4.5685	
util living area	0.9834	0.9720	0.9509	0.9043	0.8108	0.6487	0.4857	0.5165	0.7266	0.9076	0.9705	0.9864	(86)
MIT	19.9139	20.0787	20.3093	20.5865	20.8153	20.9517	20.9897	20.9863	20.9160	20.6384	20.2283	19.8773	(87)
Th 2	20.0194	20.0214	20.0233	20.0325	20.0343	20.0423	20.0423	20.0438	20.0392	20.0343	20.0308	20.0271	(88)
util rest of house	0.9792	0.9651	0.9384	0.8793	0.7619	0.5675	0.3848	0.4154	0.6516	0.8786	0.9620	0.9829	(89)
MIT 2	19.0465	19.2096	19.4353	19.7052	19.9084	20.0184	20.0392	20.0393	19.9931	19.7589	19.3661	19.0168	(90)
Living area fraction									fLA = Living area / (4) =			0.2153	(91)
MIT	19.2332	19.3967	19.6234	19.8949	20.1036	20.2194	20.2438	20.2432	20.1918	19.9482	19.5517	19.2020	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2332	19.3967	19.6234	19.8949	20.1036	20.2194	20.2438	20.2432	20.1918	19.9482	19.5517	19.2020	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	685.8732	750.0911	772.0115	745.4368	652.9599	476.9145	319.6613	335.4583	502.7565	632.4771	652.6323	656.5560	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1357.8806	1315.2098	1187.9776	984.8949	751.2892	497.7438	322.7599	339.8324	541.5232	835.7363	1117.6446	1352.1745	(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	499.9735	379.7598	309.4787	172.4099	73.1570	0.0000	0.0000	0.0000	0.0000	151.2249	334.8089	517.5402	(98)
Space heating												2438.3528	(98)
Space heating per m2												(98) / (4) =	28.8904 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2703.2736 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	499.9735	379.7598	309.4787	172.4099	73.1570	0.0000	0.0000	0.0000	0.0000	151.2249	334.8089	517.5402	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	554.2943	421.0197	343.1028	191.1417	81.1053	0.0000	0.0000	0.0000	0.0000	167.6551	371.1850	573.7696	(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	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179	(64)
Efficiency of water heater (217)m	89.4892	89.4113	89.2691	88.9763	88.4555	87.6000	87.6000	87.6000	87.6000	88.8673	89.3245	87.6000	(216)
Fuel for water heating, kWh/month	204.1437	179.6096	187.7951	167.3212	163.7843	146.1087	138.7369	154.4241	154.8379	173.7947	184.8061	198.6337	(219)
Water heating fuel used												2053.9959	(219)
Annual totals kWh/year													
Space heating fuel - main system												2703.2736	(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)												385.7398	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424		-630.4424	(233)
Total delivered energy for all uses												4587.5668	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2703.2736	3.4800	94.0739 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2053.9959	3.4800	71.4791 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	385.7398	13.1900	50.8791 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-630.4424	13.1900	-83.1553 (252)
Total energy cost			263.1692 (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] =	0.8542 (257)
SAP value		88.0842
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	2703.2736	0.2160	583.9071 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2053.9959	0.2160	443.6631 (264)
Space and water heating			1027.5702 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	385.7398	0.5190	200.1989 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			939.4945 (272)
CO2 emissions per m2			11.1300 (273)
EI value			90.2711
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	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8864 = 3.926$, stars = 4
Water heating environmental impact	$0.216 / 0.8864 = 0.2437$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2000 (1b)	x 2.4000 (2b)	= 101.2800 (1b) - (3b)
First floor	42.2000 (1c)	x 2.6700 (2c)	= 112.6740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.9540 (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) = 0.1402 (8)
Pressure test					Yes
Measured/design AP50					4.3400
Infiltration rate					0.3572 (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) =	0.3036 (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												
Effective ac	0.3188	0.2960	0.3036	0.2885	0.2885	0.2809	0.2733	0.2657	0.2581	0.2809	0.2657	0.2809 (22b)
	0.5508	0.5438	0.5461	0.5416	0.5416	0.5394	0.5373	0.5353	0.5333	0.5394	0.5353	0.5394 (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)			11.8200	1.1450	13.5344		(27)
Ground Floor			42.2000	0.1100	4.6420	140.0000	5908.0000 (28a)
Brick and Block	94.8100	13.9400	80.8700	0.2400	19.4088	42.2200	3414.3314 (29a)
Pitched Roof	42.2000		42.2000	0.1000	4.2200	9.0000	379.8000 (30)
Total net area of external elements Aum(A, m ²)			179.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1372		(33)
Party Wall 1			42.8600	0.0000	0.0000	110.0000	4714.6000 (32)
Ground Floor Stud			66.6800			9.0000	600.1200 (32c)
First Floor Stud			92.4800			9.0000	832.3200 (32c)
Internal Floor 1			42.2000			18.0000	759.6000 (32d)
Internal Ceiling 1			42.2000			18.0000	759.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17368.3714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 205.7864 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1997 (36)
Total fabric heat loss (33) + (36) = 50.3369 (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	38.8907	38.3964	38.5571	38.2397	38.2397	38.0872	37.9387	37.7943	37.6539	38.0872	37.7943	38.0872 (38)
Heat transfer coeff	89.2276	88.7333	88.8940	88.5766	88.5766	88.4241	88.2756	88.1311	87.9908	88.4241	88.1311	88.4241 (39)
Average = Sum(39)m / 12 =												88.4841 (39)
HLP	1.0572	1.0513	1.0532	1.0495	1.0495	1.0477	1.0459	1.0442	1.0425	1.0477	1.0442	1.0477 (40)
HLP (average)												1.0484 (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												2.5411 (42)
Average daily hot water use (litres/day)												94.5503 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0054	100.2234	96.4413	92.6593	88.8773	85.0953	85.0953	88.8773	92.6593	96.4413	100.2234	104.0054 (44)
Energy conte	154.2370	134.8966	139.2012	121.3590	116.4469	100.4848	93.1139	106.8496	108.1257	126.0101	137.5499	149.3703 (45)
Energy content (annual)										Total = Sum(45)m =		1487.6450 (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	23.1355	20.2345	20.8802	18.2039	17.4670	15.0727	13.9671	16.0274	16.2189	18.9015	20.6325	22.4055 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	28.4496	25.6947	28.4416	27.5172	28.4293	27.5064	28.4196	28.4259	27.5123	28.4366	27.5272	28.4477 (61)
Total heat required for water heating calculated for each month	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179 (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	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179 (64)
Heat gains from water heating, kWh/month	58.3962	51.2768	53.3948	47.2312	45.8259	40.2878	38.0653	42.6340	42.8299	49.0075	52.6171	56.7775 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1822.4531 (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	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.6055	48.5001	39.4429	29.8608	22.3213	18.8446	20.3623	26.4676	35.5248	45.1069	52.6464	56.1231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.8812	344.4185	335.5047	316.5282	292.5738	270.0600	255.0194	251.4821	260.3960	279.3725	303.3269	325.8406	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	(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)	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	(71)
Water heating gains (Table 5)	78.4895	76.3048	71.7672	65.5988	61.5940	55.9553	51.1630	57.3037	59.4859	65.8703	73.0794	76.3139	(72)
Total internal gains	580.5850	575.8321	553.3236	518.5966	483.0979	451.4687	433.1535	441.8623	462.0155	496.9584	535.6614	564.8864	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North				3.6700	13.4839		0.6300	0.7000	0.7700		15.1235 (74)	
East				0.6600	25.1925		0.6300	0.7000	0.7700		5.0815 (76)	
South				7.4900	56.7559		0.6300	0.7000	0.7700		129.9165 (78)	

Solar gains	150.1215	213.7918	288.3774	354.6162	377.0958	407.4557	389.3562	365.1567	327.4469	252.6609	178.3002	126.9387 (83)
Total gains	730.7065	789.6239	841.7010	873.2128	860.1937	858.9244	822.5097	807.0190	789.4624	749.6193	713.9616	691.8251 (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	54.0701	54.3714	54.2731	54.4675	54.4675	54.5615	54.6533	54.7428	54.8301	54.5615	54.7428	54.5615	
alpha	4.6047	4.6248	4.6182	4.6312	4.6312	4.6374	4.6436	4.6495	4.6553	4.6374	4.6495	4.6374	
util living area	0.9776	0.9673	0.9402	0.8794	0.7636	0.5653	0.4143	0.4212	0.6555	0.8696	0.9563	0.9811	(86)
MIT	20.0470	20.1685	20.4015	20.6686	20.8731	20.9755	20.9953	20.9950	20.9513	20.7396	20.3757	20.0268	(87)
Th 2	20.0359	20.0408	20.0392	20.0423	20.0423	20.0438	20.0452	20.0467	20.0480	20.0438	20.0467	20.0438	(88)
util rest of house	0.9720	0.9592	0.9251	0.8488	0.7058	0.4792	0.3151	0.3207	0.5732	0.8305	0.9436	0.9763	(89)
MIT 2	19.1910	19.3133	19.5368	19.7878	19.9617	20.0334	20.0441	20.0455	20.0241	19.8564	19.5216	19.1779	(90)
Living area fraction									fLA = Living area / (4) =			0.2153	(91)
MIT	19.3753	19.4975	19.7229	19.9774	20.1579	20.2362	20.2489	20.2499	20.2237	20.0465	19.7055	19.3607	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3753	19.4975	19.7229	19.9774	20.1579	20.2362	20.2489	20.2499	20.2237	20.0465	19.7055	19.3607	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9671	0.9536	0.9193	0.8465	0.7133	0.4971	0.3365	0.3424	0.5892	0.8306	0.9381	0.9719	(94)
Ext temp.	706.6860	753.0065	773.7613	739.1801	613.5905	426.9725	276.7742	276.3250	465.1638	622.6579	669.8020	672.3512	(95)
Heat loss rate W	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000	(96)
Month fracti	1291.5965	1259.7861	1130.9922	928.0512	678.3124	436.4804	277.9711	277.6029	486.0363	764.5581	1040.4309	1269.8302	(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	435.1735	340.5559	265.7798	135.9872	48.1530	0.0000	0.0000	0.0000	0.0000	105.5738	266.8528	444.5244	(98)
Space heating per m2												2042.6004	(98)
										(98) / (4) =		24.2014	(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 %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2264.5237	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	435.1735	340.5559	265.7798	135.9872	48.1530	0.0000	0.0000	0.0000	0.0000	105.5738	266.8528	444.5244	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	482.4539	377.5564	294.6561	150.7619	53.3847	0.0000	0.0000	0.0000	0.0000	117.0441	295.8457	492.8208	(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	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179	(64)
Efficiency of water heater	89.4153	89.3502	89.1763	88.8222	88.2345	87.6000	87.6000	87.6000	87.6000	88.6374	89.1883	87.6000	(216)
(217)m	89.4153	89.3502	89.1763	88.8222	88.2345	87.6000	87.6000	87.6000	87.6000	88.6374	89.1883	89.4415	(217)
Fuel for water heating, kWh/month	204.3124	179.7325	187.9905	167.6114	164.1946	146.1087	138.7369	154.4241	154.8379	174.2455	185.0883	198.8092	(219)
Water heating fuel used												2056.0920	(219)
Annual totals kWh/year													
Space heating fuel - main system												2264.5237	(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)												385.7398	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1208 * 1.00) =										-705.5602		-705.5602	(233)
Total delivered energy for all uses												4075.7953	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2264.5237	10.2300	231.6608 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2056.0920	10.2300	210.3382 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	385.7398	36.7200	141.6436 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-705.5602	36.7200	-259.0817 (252)
Total energy cost			455.1009 (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	2264.5237	0.2160	489.1371 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2056.0920	0.2160	444.1159 (264)
Space and water heating			933.2530 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	385.7398	0.5190	200.1989 (268)
Energy saving/generation technologies			
PV Unit	-705.5602	0.5190	-366.1857 (269)
Total kg/year			806.1912 (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	2264.5237	1.2200	2762.7189 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2056.0920	1.2200	2508.4323 (264)
Space and water heating			5271.1512 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	385.7398	3.0700	1184.2211 (268)
Energy saving/generation technologies			
PV Unit	-705.5602	3.0700	-2166.0698 (269)
Primary energy kWh/year			4519.5524 (272)
Primary energy kWh/m2/year			53.5492 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 88
Current environmental impact rating: B 90

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 84	-191 kg (23.7%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£84 2.26 kg/m²	B 89	A 92
Total Savings	£84 2.26 kg/m²		

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

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

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

	Current	Potential	Saving
Electricity	£169	£188	-£18
Mains gas	£545	£442	£103
Space heating	£362	£362	£0
Water heating	£210	£126	£84
Lighting	£142	£142	£0
Generated (PV)	-£259	-£259	£0
Total cost of fuels	£455	£371	£85
Total cost of uses	£455	£371	£84
Delivered energy	48 kWh/m²	37 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	10 kg/m²	7 kg/m²	2 kg/m²
Primary energy	54 kWh/m²	41 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2000 (1b)	x 2.4000 (2b)	= 101.2800 (1b) - (3b)
First floor	42.2000 (1c)	x 2.6700 (2c)	= 112.6740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.9540 (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) =							0.1402 (8)
Pressure test										Yes							
Measured/design AP50																	4.3400
Infiltration rate																	0.3572 (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) =							0.3036 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
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	(22)				
Adj infilt rate	0.3871	0.3795	0.3720	0.3340	0.3264	0.2885	0.2885	0.2809	0.3036	0.3264	0.3416	0.3568	(22a)				
Effective ac	0.5749	0.5720	0.5692	0.5558	0.5533	0.5416	0.5416	0.5394	0.5461	0.5533	0.5583	0.5636	(22b)				
													(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)			11.8200	1.1450	13.5344		(27)
Ground Floor			42.2000	0.1100	4.6420	140.0000	5908.0000 (28a)
Brick and Block	94.8100	13.9400	80.8700	0.2400	19.4088	42.2200	3414.3314 (29a)
Pitched Roof	42.2000		42.2000	0.1000	4.2200	9.0000	379.8000 (30)
Total net area of external elements Aum(A, m ²)			179.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1372		(33)
Party Wall 1			42.8600	0.0000	0.0000	110.0000	4714.6000 (32)
Ground Floor Stud			66.6800			9.0000	600.1200 (32c)
First Floor Stud			92.4800			9.0000	832.3200 (32c)
Internal Floor 1			42.2000			18.0000	759.6000 (32d)
Internal Ceiling 1			42.2000			18.0000	759.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17368.3714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 205.7864 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1997 (36)
Total fabric heat loss (33) + (36) = 50.3369 (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	40.5933	40.3878	40.1864	39.2406	39.0636	38.2397	38.2397	38.0872	38.5571	39.0636	39.4216	39.7959 (38)
Heat transfer coeff	90.9302	90.7247	90.5233	89.5774	89.4005	88.5766	88.5766	88.4241	88.8940	89.4005	89.7585	90.1328 (39)
Average = Sum(39)m / 12 =												89.5766 (39)
HLP	1.0774	1.0749	1.0726	1.0613	1.0592	1.0495	1.0495	1.0477	1.0532	1.0592	1.0635	1.0679 (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												2.5411 (42)
Average daily hot water use (litres/day)												94.5503 (43)
Daily hot water use	104.0054	100.2234	96.4413	92.6593	88.8773	85.0953	85.0953	88.8773	92.6593	96.4413	100.2234	104.0054 (44)
Energy conte	154.2370	134.8966	139.2012	121.3590	116.4469	100.4848	93.1139	106.8496	108.1257	126.0101	137.5499	149.3703 (45)
Energy content (annual)										Total = Sum(45)m =		1487.6450 (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	23.1355	20.2345	20.8802	18.2039	17.4670	15.0727	13.9671	16.0274	16.2189	18.9015	20.6325	22.4055 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	28.4496	25.6947	28.4416	27.5172	28.4293	27.5064	28.4196	28.4259	27.5123	28.4366	27.5272	28.4477 (61)
Total heat required for water heating calculated for each month	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179 (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												1.2191 (H8)
Utilisation factor												0.5597 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.5503 (H14)
Volume ratio Veff/V												0.7932 (H15)
Solar storage volume factor												0.9537 (H16)
Solar input	-24.6825	-41.1879	-70.1477	-94.0118	-116.1436	-114.1877	-112.6787	-98.4479	-77.1045	-52.6533	-29.2769	-851.1775 (H17)
Solar input (sum of months) = Sum (63)m =												-851.1775 (63)
Output from w/h	158.0041	119.4034	97.4951	54.8644	28.7326	13.8035	8.8549	36.8276	58.5335	101.7934	135.8002	157.1629 (64)
Total per year (kWh/year) = Sum (64)m =												971.2756 (64)
Heat gains from water heating, kWh/month	58.3962	51.2768	53.3948	47.2312	45.8259	40.2878	38.0653	42.6340	42.8299	49.0075	52.6171	56.7775 (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	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.6055	48.5001	39.4429	29.8608	22.3213	18.8446	20.3623	26.4676	35.5248	45.1069	52.6464	56.1231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.8812	344.4185	335.5047	316.5282	292.5738	270.0600	255.0194	251.4821	260.3960	279.3725	303.3269	325.8406	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	(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)	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	(71)
Water heating gains (Table 5)	78.4895	76.3048	71.7672	65.5988	61.5940	55.9553	51.1630	57.3037	59.4859	65.8703	73.0794	76.3139	(72)
Total internal gains	580.5850	575.8321	553.3236	518.5966	483.0979	451.4687	433.1535	441.8623	462.0155	496.9584	535.6614	564.8864	(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			
North				3.6700	10.6334	0.6300	0.7000	0.7700	11.9264 (74)			
East				0.6600	19.6403	0.6300	0.7000	0.7700	3.9615 (76)			
South				7.4900	46.7521	0.6300	0.7000	0.7700	107.0174 (78)			
Solar gains	122.9054	205.8085	274.7506	333.1534	369.5571	366.1115	353.2325	325.6551	294.6287	225.3683	146.5045	105.6731 (83)
Total gains	703.4903	781.6407	828.0742	851.7500	852.6549	817.5801	786.3860	767.5174	756.6441	722.3267	682.1659	670.5595 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.0577	53.1779	53.2962	53.8590	53.9656	54.4675	54.4675	54.5615	54.2731	53.9656	53.7503	53.5271	
alpha	4.5372	4.5452	4.5531	4.5906	4.5977	4.6312	4.6312	4.6374	4.6182	4.5977	4.5834	4.5685	
util living area	0.9834	0.9720	0.9509	0.9043	0.8108	0.6487	0.4857	0.5165	0.7266	0.9076	0.9705	0.9864	(86)
MIT	19.9139	20.0787	20.3093	20.5865	20.8153	20.9517	20.9897	20.9863	20.9160	20.6384	20.2283	19.8773	(87)
Th 2	20.0194	20.0214	20.0233	20.0325	20.0343	20.0423	20.0423	20.0438	20.0392	20.0343	20.0308	20.0271	(88)
util rest of house	0.9792	0.9651	0.9384	0.8793	0.7619	0.5675	0.3848	0.4154	0.6516	0.8786	0.9620	0.9829	(89)
MIT 2	19.0465	19.2096	19.4353	19.7052	19.9084	20.0184	20.0392	20.0393	19.9931	19.7589	19.3661	19.0168	(90)
Living area fraction									fLA = Living area / (4) =			0.2153	(91)
MIT	19.2332	19.3967	19.6234	19.8949	20.1036	20.2194	20.2438	20.2432	20.1918	19.9482	19.5517	19.2020	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2332	19.3967	19.6234	19.8949	20.1036	20.2194	20.2438	20.2432	20.1918	19.9482	19.5517	19.2020	(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	0.9750	0.9596	0.9323	0.8752	0.7658	0.5833	0.4065	0.4371	0.6645	0.8756	0.9567	0.9791	(94)
Useful gains	685.8732	750.0911	772.0115	745.4368	652.9599	476.9145	319.6613	335.4583	502.7565	632.4771	652.6323	656.5560	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1357.8806	1315.2098	1187.9776	984.8949	751.2892	497.7438	322.7599	339.8324	541.5232	835.7363	1117.6446	1352.1745	(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	499.9735	379.7598	309.4787	172.4099	73.1570	0.0000	0.0000	0.0000	0.0000	151.2249	334.8089	517.5402	(98)
Space heating												2438.3528	(98)
Space heating per m2											(98) / (4) =	28.8904	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.2000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2703.2736	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	499.9735	379.7598	309.4787	172.4099	73.1570	0.0000	0.0000	0.0000	0.0000	151.2249	334.8089	517.5402	(98)	
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)	
Space heating fuel (main heating system)	554.2943	421.0197	343.1028	191.1417	81.1053	0.0000	0.0000	0.0000	0.0000	167.6551	371.1850	573.7696	(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	158.0041	119.4034	97.4951	54.8644	28.7326	13.8035	8.8549	36.8276	58.5335	101.7934	135.8002	157.1629	(64)	
Efficiency of water heater	89.5617	89.5641	89.5632	89.5583	89.4513	87.6000	87.6000	87.6000	87.6000	89.1356	89.4340	89.5807	(216)	
(217)m	89.5617	89.5641	89.5632	89.5583	89.4513	87.6000	87.6000	87.6000	87.6000	89.1356	89.4340	89.5807	(217)	
Fuel for water heating, kWh/month	176.4194	133.3161	108.8563	61.2611	32.1209	15.7574	10.1083	42.0406	66.8191	114.2005	151.8439	175.4429	(219)	
Water heating fuel used												1088.1866	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2703.2736	(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)												385.7398	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1080 * 1.00) =										-630.4424		-630.4424	(233)	
Total delivered energy for all uses												3671.7576	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2703.2736	3.4800	94.0739	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1088.1866	3.4800	37.8689	(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	385.7398	13.1900	50.8791	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-630.4424	13.1900	-83.1553	(252)
Total energy cost			236.1540	(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] =	0.7665	(257)
SAP value			89.3074	
SAP rating (Section 12)			89	(258)
SAP band			B	

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

Energy	Emission factor	Emissions
--------	-----------------	-----------

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	2703.2736	0.2160	583.9071 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1088.1866	0.2160	235.0483 (264)
Space and water heating			818.9554 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	385.7398	0.5190	200.1989 (268)
Energy saving/generation technologies			
PV Unit	-630.4424	0.5190	-327.1996 (269)
Total kg/year			756.8297 (272)
CO2 emissions per m2			8.9700 (273)
EI value			92.1627
EI rating			92 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2000 (1b)	x 2.4000 (2b)	= 101.2800 (1b) - (3b)
First floor	42.2000 (1c)	x 2.6700 (2c)	= 112.6740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.9540 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1402 (8)
Pressure test					Yes
Measured/design AP50					4.3400
Infiltration rate					0.3572 (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) =		0.3036 (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												
Effective ac	0.3188	0.2960	0.3036	0.2885	0.2885	0.2809	0.2733	0.2657	0.2581	0.2809	0.2657	0.2809 (22b)
	0.5508	0.5438	0.5461	0.5416	0.5416	0.5394	0.5373	0.5353	0.5333	0.5394	0.5353	0.5394 (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)			11.8200	1.1450	13.5344		(27)
Ground Floor			42.2000	0.1100	4.6420	140.0000	5908.0000 (28a)
Brick and Block	94.8100	13.9400	80.8700	0.2400	19.4088	42.2200	3414.3314 (29a)
Pitched Roof	42.2000		42.2000	0.1000	4.2200	9.0000	379.8000 (30)
Total net area of external elements Aum(A, m ²)			179.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1372		(33)
Party Wall 1			42.8600	0.0000	0.0000	110.0000	4714.6000 (32)
Ground Floor Stud			66.6800			9.0000	600.1200 (32c)
First Floor Stud			92.4800			9.0000	832.3200 (32c)
Internal Floor 1			42.2000			18.0000	759.6000 (32d)
Internal Ceiling 1			42.2000			18.0000	759.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17368.3714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 205.7864 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1997 (36)
Total fabric heat loss (33) + (36) = 50.3369 (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	38.8907	38.3964	38.5571	38.2397	38.2397	38.0872	37.9387	37.7943	37.6539	38.0872	37.7943	38.0872 (38)
Heat transfer coeff	89.2276	88.7333	88.8940	88.5766	88.5766	88.4241	88.2756	88.1311	87.9908	88.4241	88.1311	88.4241 (39)
Average = Sum(39)m / 12 =												88.4841 (39)
HLP	1.0572	1.0513	1.0532	1.0495	1.0495	1.0477	1.0459	1.0442	1.0425	1.0477	1.0442	1.0477 (40)
HLP (average)												1.0484 (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												2.5411 (42)
Average daily hot water use (litres/day)												94.5503 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0054	100.2234	96.4413	92.6593	88.8773	85.0953	85.0953	88.8773	92.6593	96.4413	100.2234	104.0054 (44)
Energy conte	154.2370	134.8966	139.2012	121.3590	116.4469	100.4848	93.1139	106.8496	108.1257	126.0101	137.5499	149.3703 (45)
Energy content (annual)										Total = Sum(45)m =		1487.6450 (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	23.1355	20.2345	20.8802	18.2039	17.4670	15.0727	13.9671	16.0274	16.2189	18.9015	20.6325	22.4055 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	28.4496	25.6947	28.4416	27.5172	28.4293	27.5064	28.4196	28.4259	27.5123	28.4366	27.5272	28.4477 (61)
Total heat required for water heating calculated for each month	182.6866	160.5913	167.6429	148.8762	144.8762	127.9912	121.5336	135.2755	135.6380	154.4466	165.0771	177.8179 (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												1.3644 (H8)
Utilisation factor												0.5195 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.5503 (H14)
Volume ratio Veff/V												0.7932 (H15)
Solar storage volume factor												0.9537 (H16)
Solar input	-28.8449	-41.0157	-70.4961	-95.1156	-111.7189	-119.3335	-116.8239	-104.5609	-81.8640	-56.5979	-34.1160	-884.2063 (H17)
Solar input (sum of months) = Sum (63)m =												-884.2063 (63)
Output from w/h	153.8416	119.5756	97.1468	53.7606	33.1573	8.6577	4.7097	30.7146	53.7740	97.8487	130.9611	154.0990 (64)
Total per year (kWh/year) = Sum (64)m =												938.2469 (64)
Heat gains from water heating, kWh/month	58.3962	51.2768	53.3948	47.2312	45.8259	40.2878	38.0653	42.6340	42.8299	49.0075	52.6171	56.7775 (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	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	152.4640	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.6055	48.5001	39.4429	29.8608	22.3213	18.8446	20.3623	26.4676	35.5248	45.1069	52.6464	56.1231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.8812	344.4185	335.5047	316.5282	292.5738	270.0600	255.0194	251.4821	260.3960	279.3725	303.3269	325.8406	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	52.7875	(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)	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	-101.6427	(71)
Water heating gains (Table 5)	78.4895	76.3048	71.7672	65.5988	61.5940	55.9553	51.1630	57.3037	59.4859	65.8703	73.0794	76.3139	(72)
Total internal gains	580.5850	575.8321	553.3236	518.5966	483.0979	451.4687	433.1535	441.8623	462.0155	496.9584	535.6614	564.8864	(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			
North				3.6700	13.4839	0.6300	0.7000	0.7700	15.1235 (74)			
East				0.6600	25.1925	0.6300	0.7000	0.7700	5.0815 (76)			
South				7.4900	56.7559	0.6300	0.7000	0.7700	129.9165 (78)			
Solar gains	150.1215	213.7918	288.3774	354.6162	377.0958	407.4557	389.3562	365.1567	327.4469	252.6609	178.3002	126.9387 (83)
Total gains	730.7065	789.6239	841.7010	873.2128	860.1937	858.9244	822.5097	807.0190	789.4624	749.6193	713.9616	691.8251 (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	54.0701	54.3714	54.2731	54.4675	54.4675	54.5615	54.6533	54.7428	54.8301	54.5615	54.7428	54.5615
alpha	4.6047	4.6248	4.6182	4.6312	4.6312	4.6374	4.6436	4.6495	4.6553	4.6374	4.6495	4.6374
util living area	0.9776	0.9673	0.9402	0.8794	0.7636	0.5653	0.4143	0.4212	0.6555	0.8696	0.9563	0.9811 (86)
MIT	20.0470	20.1685	20.4015	20.6686	20.8731	20.9755	20.9953	20.9950	20.9513	20.7396	20.3757	20.0268 (87)
Th 2	20.0359	20.0408	20.0392	20.0423	20.0423	20.0438	20.0452	20.0467	20.0480	20.0438	20.0467	20.0438 (88)
util rest of house	0.9720	0.9592	0.9251	0.8488	0.7058	0.4792	0.3151	0.3207	0.5732	0.8305	0.9436	0.9763 (89)
MIT 2	19.1910	19.3133	19.5368	19.7878	19.9617	20.0334	20.0441	20.0455	20.0241	19.8564	19.5216	19.1779 (90)
Living area fraction												
MIT	19.3753	19.4975	19.7229	19.9774	20.1579	20.2362	20.2489	20.2499	fLA = Living area / (4) =			0.2153 (91)
Temperature adjustment									20.2237	20.0465	19.7055	19.3607 (92)
adjusted MIT	19.3753	19.4975	19.7229	19.9774	20.1579	20.2362	20.2489	20.2499	20.2237	20.0465	19.7055	19.3607 (93)
												0.0000

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	0.9671	0.9536	0.9193	0.8465	0.7133	0.4971	0.3365	0.3424	0.5892	0.8306	0.9381	0.9719	(94)
Useful gains	706.6860	753.0065	773.7613	739.1801	613.5905	426.9725	276.7742	276.3250	465.1638	622.6579	669.8020	672.3512	(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	1291.5965	1259.7861	1130.9922	928.0512	678.3124	436.4804	277.9711	277.6029	486.0363	764.5581	1040.4309	1269.8302	(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	435.1735	340.5559	265.7798	135.9872	48.1530	0.0000	0.0000	0.0000	0.0000	105.5738	266.8528	444.5244	(98)
Space heating												2042.6004	(98)
Space heating per m2												24.2014	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.2000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2264.5237	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	435.1735	340.5559	265.7798	135.9872	48.1530	0.0000	0.0000	0.0000	0.0000	105.5738	266.8528	444.5244	(98)	
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)	
Space heating fuel (main heating system)	482.4539	377.5564	294.6561	150.7619	53.3847	0.0000	0.0000	0.0000	0.0000	117.0441	295.8457	492.8208	(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	153.8416	119.5756	97.1468	53.7606	33.1573	8.6577	4.7097	30.7146	53.7740	97.8487	130.9611	154.0990	(64)	
Efficiency of water heater	89.5061	89.5096	89.4890	89.4478	89.1213	87.6000	87.6000	87.6000	87.6000	88.9304	89.3272	89.5161	(217)	
Fuel for water heating, kWh/month	171.8783	133.5897	108.5572	60.1028	37.2046	9.8832	5.3764	35.0624	61.3859	110.0284	146.6083	172.1468	(219)	
Water heating fuel used												1051.8240	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2264.5237	(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)													385.7398	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1208 * 1.00) =										-705.5602			-705.5602	(233)
Total delivered energy for all uses													3121.5273	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2264.5237	10.2300	231.6608	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1051.8240	10.2300	107.6016	(247)
Pumps and fans for heating	75.0000	36.7200	27.5400	(249)
Pump for solar water heating	50.0000	36.7200	18.3600	(249)
Energy for lighting	385.7398	36.7200	141.6436	(250)
Additional standing charges			103.0000	(251)
Energy saving/generation technologies				
PV Unit	-705.5602	36.7200	-259.0817	(252)
Total energy cost			370.7243	(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	2264.5237	0.2160	489.1371	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1051.8240	0.2160	227.1940	(264)
Space and water heating			716.3311	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	385.7398	0.5190	200.1989	(268)
Energy saving/generation technologies				
PV Unit	-705.5602	0.5190	-366.1857	(269)
Total kg/year			615.2193	(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	2264.5237	1.2200	2762.7189 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1051.8240	1.2200	1283.2253 (264)
Space and water heating			4045.9442 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	385.7398	3.0700	1184.2211 (268)
Energy saving/generation technologies			
PV Unit	-705.5602	3.0700	-2166.0698 (269)
Primary energy kWh/year			3447.8455 (272)
Primary energy kWh/m2/year			40.8512 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0645 Plot 20	Issued on Date	02/01/2024
Assessment Reference	As Built	Prop Type Ref	Block G
Project	11, Wheatear Road, Botley, SO32 2TX		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.08	TER	17.88
Environmental	90 B	% DER<TER	26.84		
CO ₂ Emissions (t/year)	0.81	DFEE	40.11	TFEE	49.73
General Requirements Compliance	Pass	% DFEE<TFEE	19.36		

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 20	Issued on Date	02/01/2024
Assessment Reference	As Built	Prop Type Ref	Block G
Project	11, Wheatear Road, Botley, SO32 2TX		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.08	TER	17.88
Environmental	90 B	% DER<TER	26.84		
CO ₂ Emissions (t/year)	0.81	DFEE	40.11	TFEE	49.73
General Requirements Compliance	Pass	% DFEE<TFEE	19.36		

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

Client	Foreman Homes, FORE
--------	---------------------

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 20	Issued on Date	02/01/2024
Assessment Reference	As Built	Prop Type Ref	Block G
Project	11, Wheatear Road, Botley, SO32 2TX		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.08	TER	17.88
Environmental	90 B	% DER<TER	26.84		
CO ₂ Emissions (t/year)	0.81	DFEE	40.11	TFEE	49.73
General Requirements Compliance	Pass	% DFEE<TFEE	19.36		

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 = 42.13 m², Perimeter = 18.68 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 20	Issued on Date	02/01/2024
Assessment Reference	As Built	Prop Type Ref	Block G
Property	11, Wheatear Road, Botley, SO32 2TX		
SAP Rating	88 B	DER	13.08
Environmental	90 B	TER	17.88
CO ₂ Emissions (t/year)	0.81	% DER<TER	26.84
General Requirements Compliance	Pass	DfEE	40.11
		TFEE	49.73
		% DfEE<TFEE	19.36
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

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

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	18.70 m	42.20 m ²	2.40 m
	1st Storey:	18.70 m	42.20 m ²	2.67 m

7.0 Living Area	18.17	m ²
-----------------	-------	----------------

8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	205.79	kJ/m ² K

9.0 External Walls			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	94.81	80.87

9.1 Party Walls			U-Value	Kappa	Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	42.86

9.2 Internal Walls			Kappa	Area
Description	Construction		(kJ/m ² K)	(m ²)
Ground floor Stud	Plasterboard on timber frame		9.00	66.68
First Floor Stud	Plasterboard on timber frame		9.00	92.48

10.0 External Roofs			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Pitched Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	42.20	42.20

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.20

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Other	0.11	140.00	42.20

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.20

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Front Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.1			0.63		0.70	1.10
Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front Elevation	Half Glazed Door	[1] Brick and Block	North							2.12	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					3.67	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					7.49	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					0.66	

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)	0.63	0.077	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)	2.75	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.60	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.51	0.070	No	Birtley Supatherm
Independently assessed	E3 Sill	7.46	0.021	No	Knauf P5
Independently assessed	E4 Jamb	26.70	0.016	No	Knauf P6
Independently assessed	E5 Ground floor (normal)	18.70	0.062	No	BE-E5-23902
Independently assessed	E6 Intermediate floor within a dwelling	18.70	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	13.85	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	4.85	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	15.18	0.039	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	5.06	0.036	No	Knauf P25 Halved
Independently assessed	E25 Staggered party wall between dwellings	5.06	0.055	No	Knauf P27 Halved
Table K1 - Default	P1 Party wall - Ground floor	8.47	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.47	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.47	0.035	No	Knauf P29 Halved

Y-value 0.035 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Tested ? Yes
As Built AP₅₀ 4.34 m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings 13
Total number of L.E.L. fittings 13
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	18907	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.2	
Controls	87.6	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
Fan Assisted Flue	Balanced	
Is MHS Pumped	Yes	
Heat Emitter	Pump in heated space	
Flow Temperature	Radiators	
Combi boiler type	Normal (> 45°C)	
	Standard Combi	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Combi keep hot type	None			
25.0 Main Heating 2	None			
Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.73	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

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