



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 4, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 11/07/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 30				Issued on Date	11/07/2024
Assessment Reference	As Built	Prop Type Ref	Type F			
Property	4, Shaw Crescent, West End, Southampton, SO30 3LH					
SAP Rating	88 B	DER	13.42	TER	18.25	
Environmental	90 B	% DER<TER	26.48			
CO ₂ Emissions (t/year)	0.80	DFEE	45.38	TFEE	52.66	
General Requirements Compliance	Pass	% DFEE<TFEE	13.82			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.25	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.42	kgCO ₂ /m ²	Pass
	-4.83 (-26.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.66	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.38	kWh/m ² /yr	
	-7.3 (-13.9%)	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	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.61 (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
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
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

Continuous extract system

Specific fan power

0.17

Maximum

0.7

Pass

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

7.82 m², No overhang

Windows facing South

5.80 m², No overhang

Windows facing West

1.91 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

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Air permeability	3.6	m ³ /m ² h
Photovoltaic array	0.74	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Environmental	90 B	TER	18.25
CO ₂ Emissions (t/year)	0.80	% DER<TER	26.48
General Requirements Compliance	Pass	DFEE	45.38
		TFEE	52.66
		% DFEE<TFEE	13.82
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	0.071	2.84	0.20	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	8.74	0.56	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	10.55	0.22	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	29.10	0.47	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	20.06	6.42	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	20.06	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	14.06	0.84	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	6.02	0.26	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.00	0.39	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.00	0.36	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	6.02	0.96	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	6.02	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	6.02	0.21	Knauf P29 Halved

Total: **11.01** W/mK:
Y-Value: **0.060** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Semi-Detached House, total floor area 84 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.25 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.42 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 45.4 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	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.61 (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

Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)

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

Continuous extract system

Specific fan power: 0.17
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing North: 7.82 m², No overhang

Windows facing South: 5.80 m², No overhang

Windows facing West: 1.91 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 0.12 W/m²K

Door U-value 1.10 W/m²K

Air permeability 3.6 m³/m²h

Photovoltaic array 0.74 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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (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					0 * 10 = 0.0000 (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)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.6100
Infiltration rate					0.1805 (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) =	0.1534 (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	0.1956	0.1918	0.1879	0.1688	0.1649	0.1458	0.1458	0.1419	0.1534	0.1649	0.1726	0.1803 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)					
Total net area of external elements Aum(A, m2)			184.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		49.2558		(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)					
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)					
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)					
First Floor Stud			102.7200			9.0000	924.4800 (32c)					
Internal Floor 1			42.1800			18.0000	759.2400 (32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		15716.0444 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0063 (36)					
Total fabric heat loss						(33) + (36) =	60.2621 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985 (38)
Average = Sum(39)m / 12 =	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268 (40)
HLP (average)												1.1268 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (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	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (64)
Heat gains from water heating, kWh/month	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (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	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7166	18.4003	14.9641	11.3288	8.4684	7.1494	7.7252	10.0415	13.4776	17.1130	19.9733	21.2924 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3113	230.6804	224.7102	212.0004	195.9565	180.8775	170.8038	168.4346	174.4048	187.1147	203.1586	218.2376 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
Total internal gains	382.2776	380.1471	366.1832	343.6458	320.7198	298.6632	284.3613	290.4697	302.0697	324.8230	350.9635	370.5979 (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				7.8200	10.6334		0.6300		0.7000		0.7700		25.4127 (74)
South				5.8000	46.7521		0.6300		0.7000		0.7700		82.8706 (78)
West				1.9100	19.6403		0.6300		0.7000		0.7700		11.4644 (80)
Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209	(83)
Total gains	502.0253	586.8597	658.5248	725.4624	768.9124	753.3495	718.6241	673.2578	624.8434	555.6321	494.8381	472.8188	(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	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241
alpha	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616
util living area	0.9936	0.9873	0.9734	0.9371	0.8541	0.7089	0.5532	0.6050	0.8214	0.9554	0.9883	0.9950 (86)
MIT	19.4742	19.6671	19.9665	20.3407	20.6814	20.8958	20.9709	20.9581	20.8001	20.3584	19.8336	19.4211 (87)
Th 2	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790 (88)
util rest of house	0.9920	0.9841	0.9663	0.9193	0.8117	0.6262	0.4374	0.4892	0.7553	0.9392	0.9848	0.9937 (89)
MIT 2	18.5880	18.7795	19.0750	19.4376	19.7506	19.9235	19.9694	19.9637	19.8572	19.4608	18.9461	18.5352 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	18.7908	18.9825	19.2790	19.6442	19.9636	20.1459	20.1985	20.1912	20.0729	19.6662	19.1491	18.7379 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7908	18.9825	19.2790	19.6442	19.9636	20.1459	20.1985	20.1912	20.0729	19.6662	19.1491	18.7379 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9894	0.9800	0.9601	0.9123	0.8109	0.6408	0.4635	0.5148	0.7623	0.9330	0.9809	0.9915 (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	1377.5024	1338.6944	1214.7773	1021.3544	785.5416	527.1975	342.0749	360.3959	567.7861	861.8379	1145.3991	1381.9828 (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	655.3142	513.1293	433.3896	258.8691	120.5372	0.0000	0.0000	0.0000	0.0000	255.5175	475.1952	679.3992 (98)
Space heating												3391.3512 (98)
Space heating per m2												(98) / (4) = 40.2009 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	90.2000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	3759.8129 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	655.3142	513.1293	433.3896	258.8691	120.5372	0.0000	0.0000	0.0000	0.0000	255.5175	475.1952	679.3992 (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)	726.5124	568.8795	480.4762	286.9946	133.6332	0.0000	0.0000	0.0000	0.0000	283.2788	526.8239	753.2142 (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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (64)
Efficiency of water heater (217)m	87.1894	86.9205	86.3943	85.2706	82.8338	76.4000	76.4000	76.4000	76.4000	85.1085	86.6738	76.4000 (216)
Fuel for water heating, kWh/month	177.6385	155.8677	161.7954	142.8917	141.1176	132.0061	122.3231	140.3913	142.0921	148.6759	159.3859	171.7235 (219)
Water heating fuel used	1795.9088 (219)											
Annual totals kWh/year												
Space heating fuel - main system	3759.8129 (211)											
Space heating fuel - secondary	0.0000 (215)											
Electricity for pumps and fans:												
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)												
mechanical ventilation fans (SFP = 0.2380)	61.2369 (230a)											
central heating pump	30.0000 (230c)											
main heating flue fan	45.0000 (230e)											
Total electricity for the above, kWh/year	136.2369 (231)											
Electricity for lighting (calculated in Appendix L)	365.8614 (232)											
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.74 * 1068 * 1.00) =	-632.2977											
Total delivered energy for all uses	5425.5223 (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	3759.8129	0.2160	812.1196 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1795.9088	0.2160	387.9163 (264)
Space and water heating			1200.0359 (265)
Pumps and fans	136.2369	0.5190	70.7070 (267)
Energy for lighting	365.8614	0.5190	189.8821 (268)
Energy saving/generation technologies			
PV Unit	-632.2977	0.5190	-328.1625 (269)
Total CO2, kg/year			1132.4624 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.4200 (273)

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

DER		13.4200 ZC1
Total Floor Area	TFA	84.3600
Assumed number of occupants	N	2.5404
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.0375 ZC2
CO2 emissions from cooking, equation (L16)		2.1334 ZC3
Total CO2 emissions		31.5909 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		31.5909 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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (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) = 0.1422 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3922 (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) =				0.3334 (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	0.4251	0.4168	0.4084	0.3668	0.3584	0.3167	0.3167	0.3084	0.3334	0.3584	0.3751	0.3918 (22b)
Effective ac	0.5904	0.5868	0.5834	0.5673	0.5642	0.5502	0.5502	0.5476	0.5556	0.5642	0.5703	0.5767 (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 Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			15.5300	1.3258	20.5890		(27)
Ground Floor			42.1800	0.1300	5.4834		(28a)
Brick and Block	100.3000	17.6800	82.6200	0.1800	14.8716		(29a)
Pitched Roof	42.1800		42.1800	0.1300	5.4834		(30)
Total net area of external elements Aum(A, m ²)			184.6600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5774		(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)							9.7594 (36)
Total fabric heat loss						(33) + (36) =	58.3368 (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	41.0869	40.8427	40.6033	39.4791	39.2688	38.2896	38.2896	38.1083	38.6668	39.2688	39.6943	40.1392 (38)
Heat transfer coeff	99.4237	99.1795	98.9402	97.8159	97.6056	96.6264	96.6264	96.4451	97.0036	97.6056	98.0311	98.4760 (39)
Average = Sum(39)m / 12 =												97.8149 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1786	1.1757	1.1728	1.1595	1.1570	1.1454	1.1454	1.1433	1.1499	1.1570	1.1621	1.1673 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total = Sum(45)m =		1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (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	49.1373	45.6874	45.2834	41.9578	43.3564	45.2834	45.6874	49.1373	49.3151	50.9589 (61)
Solar input	205.1701	180.9015	188.3153	167.0262	161.7108	142.4258	136.4548	152.1151	153.7951	175.1263	186.8420	200.3043 (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	205.1701	180.9015	188.3153	167.0262	161.7108	142.4258	136.4548	152.1151	153.7951	175.1263	186.8420	200.3043 (64)
	64.0150	56.3525	58.5610	51.7670	50.0330	43.8951	41.7943	46.8424	47.3677	54.1757	58.0565	62.3971 (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	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7166	18.4003	14.9641	11.3288	8.4684	7.1494	7.7252	10.0415	13.4776	17.1130	19.9733	21.2924	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3113	230.6804	224.7102	212.0004	195.9565	180.8775	170.8038	168.4346	174.4048	187.1147	203.1586	218.2376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	(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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	(71)
Water heating gains (Table 5)	86.0416	83.8579	78.7110	71.8986	67.2486	60.9654	56.1752	62.9602	65.7884	72.8168	80.6340	83.8670	(72)
Total internal gains	399.1755	397.0446	382.4914	359.3338	335.7796	313.0983	298.8102	305.5424	317.7769	341.1505	367.8720	387.5030	(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				7.8200	10.6334	0.6300	0.7000	0.7700		25.4127 (74)		
South				5.8000	46.7521	0.6300	0.7000	0.7700		82.8706 (78)		
West				1.9100	19.6403	0.6300	0.7000	0.7700		11.4644 (80)		
Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209 (83)
Total gains	518.9233	603.7572	674.8331	741.1504	783.9721	767.7846	733.0730	688.3305	640.5506	571.9596	511.7465	489.7239 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.9229	59.0680	59.2109	59.8914	60.0205	60.6287	60.6287	60.7427	60.3929	60.0205	59.7599	59.4900	
alpha	4.9282	4.9379	4.9474	4.9928	5.0014	5.0419	5.0419	5.0495	5.0262	5.0014	4.9840	4.9660	
util living area	0.9978	0.9949	0.9872	0.9616	0.8880	0.7333	0.5637	0.6177	0.8518	0.9744	0.9952	0.9983	(86)
MIT	19.7345	19.8962	20.1480	20.4767	20.7648	20.9383	20.9867	20.9794	20.8623	20.4910	20.0521	19.7066	(87)
Th 2	19.9372	19.9395	19.9418	19.9525	19.9545	19.9639	19.9639	19.9657	19.9603	19.9545	19.9505	19.9462	(88)
util rest of house	0.9970	0.9931	0.9825	0.9467	0.8445	0.6417	0.4393	0.4920	0.7806	0.9617	0.9933	0.9978	(89)
MIT 2	18.2545	18.4918	18.8589	19.3349	19.7207	19.9221	19.9590	19.9571	19.8487	19.3634	18.7279	18.2200	(90)
Living area fraction	18.5931	18.8131	19.1538	19.5961	19.9596	20.1546	20.1941	20.1910	20.0806	19.6214	19.0309	18.5601	(92)
MIT	18.5931	18.8131	19.1538	19.5961	19.9596	20.1546	20.1941	20.1910	20.0806	19.6214	19.0309	18.5601	(93)
Temperature adjustment												0.0000	
adjusted MIT	18.5931	18.8131	19.1538	19.5961	19.9596	20.1546	20.1941	20.1910	20.0806	19.6214	19.0309	18.5601	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9956	0.9904	0.9778	0.9403	0.8448	0.6600	0.4679	0.5207	0.7902	0.9562	0.9908	0.9966	(94)
Ext temp.	516.6180	597.9821	659.8308	696.8936	662.2926	506.7089	343.0142	358.4405	506.1585	546.9153	507.0358	488.0678	(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	1421.0740	1379.8960	1251.9709	1046.2479	806.1816	536.7218	347.2877	365.6213	580.1399	880.5355	1169.5961	1414.1268	(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	672.9153	525.4461	440.5522	251.5352	107.0534	0.0000	0.0000	0.0000	0.0000	248.2134	477.0434	688.9879	(98)
Space heating per m2												3411.7469	(98)
												40.4427	(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												3652.8340 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	672.9153	525.4461	440.5522	251.5352	107.0534	0.0000	0.0000	0.0000	0.0000	248.2134	477.0434	688.9879 (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)	720.4661	562.5762	471.6833	269.3096	114.6182	0.0000	0.0000	0.0000	0.0000	265.7531	510.7531	737.6744 (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	205.1701	180.9015	188.3153	167.0262	161.7108	142.4258	136.4548	152.1151	153.7951	175.1263	186.8420	200.3043 (64)
Efficiency of water heater (217)m	87.8191	87.5788	87.1187	86.0795	84.0400	80.3000	80.3000	80.3000	80.3000	85.9290	87.3094	80.3000 (216)
Fuel for water heating, kWh/month	233.6282	206.5585	216.1594	194.0370	192.4213	177.3672	169.9313	189.4335	191.5256	203.8036	214.0000	227.8528 (219)
Water heating fuel used												2416.7184 (219)
Annual totals kWh/year												
Space heating fuel - main system												3652.8340 (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)												365.8614 (232)
Total delivered energy for all uses												6510.4138 (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	3652.8340	0.2160	789.0121 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2416.7184	0.2160	522.0112 (264)
Space and water heating			1311.0233 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	365.8614	0.5190	189.8821 (268)
Total CO2, kg/m2/year			1539.8304 (272)
Emissions per m2 for space and water heating			15.5408 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2509 (272b)
Emissions per m2 for pumps and fans			0.4614 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5408 * 1.00) + 2.2509 + 0.4614, rounded to 2 d.p.			18.2500 (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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (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) = 0.1422 (8)
Pressure test					Yes
Measured/design AP50					3.6100
Infiltration rate					0.3227 (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) =	0.2743 (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	0.3498	0.3429	0.3361	0.3018	0.2949	0.2606	0.2606	0.2538	0.2743	0.2949	0.3086	0.3223 (22b)
Effective ac	0.5612	0.5588	0.5565	0.5455	0.5435	0.5340	0.5340	0.5322	0.5376	0.5435	0.5476	0.5520 (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			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)
Total net area of external elements Aum(A, m ²)			184.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.2558		(33)
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)
First Floor Stud			102.7200			9.0000	924.4800 (32c)
Internal Floor 1			42.1800			18.0000	759.2400 (32d)
Internal Ceiling 1			42.1800			9.0000	379.6200 (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) = 15336.4244 (34)
181.7973 (35)
11.0063 (36)
(33) + (36) = 60.2621 (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	39.0559	38.8906	38.7285	37.9674	37.8250	37.1621	37.1621	37.0393	37.4174	37.8250	38.1131	38.4143 (38)
Heat transfer coeff	99.3180	99.1527	98.9906	98.2295	98.0871	97.4242	97.4242	97.3014	97.6795	98.0871	98.3752	98.6764 (39)
Average = Sum(39)m / 12 =												98.2288 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1773	1.1754	1.1734	1.1644	1.1627	1.1549	1.1549	1.1534	1.1579	1.1627	1.1661	1.1697 (40)
HLP (average)												1.1644 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.5404 (42)
94.5346 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)

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Energy content (annual)	Total = Sum(45)m = 1487.3969 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.7699	28.6608	29.5753	25.7845	24.7408	21.3495	19.7834	22.7018	22.9729	26.7727	29.2245	31.7359 (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	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7166	18.4003	14.9641	11.3288	8.4684	7.1494	7.7252	10.0415	13.4776	17.1130	19.9733	21.2924	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3113	230.6804	224.7102	212.0004	195.9565	180.8775	170.8038	168.4346	174.4048	187.1147	203.1586	218.2376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	(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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	(71)
Water heating gains (Table 5)	44.0455	42.6499	39.7518	35.8118	33.2538	29.6520	26.5906	30.5131	31.9068	35.9848	40.5895	42.6558	(72)
Total internal gains	354.1795	352.8367	340.5322	320.2470	298.7848	278.7849	266.2256	270.0953	280.8953	301.3185	324.8275	343.2917	(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				7.8200	10.6334	0.6300	0.7000		0.7700		25.4127 (74)	
South				5.8000	46.7521	0.6300	0.7000		0.7700		82.8706 (78)	
West				1.9100	19.6403	0.6300	0.7000		0.7700		11.4644 (80)	
Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209 (83)
Total gains	473.9272	559.5492	632.8738	702.0636	746.9773	733.4713	700.4885	652.8833	603.6690	532.1276	468.7021	445.5126 (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	42.8937	42.9652	43.0356	43.3690	43.4320	43.7275	43.7275	43.7827	43.6132	43.4320	43.3048	43.1726	
alpha	3.8596	3.8643	3.8690	3.8913	3.8955	3.9152	3.9152	3.9188	3.9075	3.8955	3.8870	3.8782	
util living area	0.9943	0.9886	0.9760	0.9429	0.8667	0.7274	0.5738	0.6274	0.8376	0.9605	0.9897	0.9955	(86)
MIT	19.3253	19.5280	19.8457	20.2550	20.6253	20.8724	20.9621	20.9461	20.7615	20.2796	19.7223	19.2844	(87)
Th 2	19.9382	19.9398	19.9413	19.9486	19.9499	19.9563	19.9563	19.9575	19.9538	19.9499	19.9472	19.9443	(88)
util rest of house	0.9929	0.9857	0.9696	0.9264	0.8263	0.6448	0.4539	0.5085	0.7741	0.9459	0.9866	0.9944	(89)
MIT 2	18.4112	18.6138	18.9292	19.3334	19.6782	19.8870	19.9435	19.9374	19.8058	19.3643	18.8139	18.3751	(90)
Living area fraction	18.6203	18.8230	19.1389	19.5442	19.8949	20.1124	20.1765	20.1682	20.0244	19.5737	19.0217	18.5831	(91)
MIT	18.6203	18.8230	19.1389	19.5442	19.8949	20.1124	20.1765	20.1682	20.0244	19.5737	19.0217	18.5831	(92)
Temperature adjustment	18.6203	18.8230	19.1389	19.5442	19.8949	20.1124	20.1765	20.1682	20.0244	19.5737	19.0217	18.5831	(93)
adjusted MIT	18.6203	18.8230	19.1389	19.5442	19.8949	20.1124	20.1765	20.1682	20.0244	19.5737	19.0217	18.5831	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	469.3592	549.2706	609.6454	644.9636	615.3789	482.9000	336.6836	348.8518	470.3048	499.7449	460.6492	442.0830	(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	1422.2678	1380.4993	1251.1321	1045.5769	803.8128	537.0437	348.4386	366.6478	578.6948	880.2085	1172.8013	1419.2766	(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	708.9640	558.5856	477.2661	288.4416	140.1949	0.0000	0.0000	0.0000	0.0000	283.0649	512.7495	727.0321	(98)
Space heating												3696.2986	(98)
Space heating per m2												43.8158	(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	915.7874	720.9390	739.4908	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8119	0.8782	0.8513	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	743.5368	633.1188	629.5069	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	952.5343	912.0054	858.0173	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	150.4782	207.4917	170.0117	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												527.9816 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	37.6195	51.8729	42.5029	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												131.9954 (107)
Space cooling per m2												1.5647 (108)
Energy for space heating												43.8158 (99)
Energy for space cooling												1.5647 (108)
Total												45.3804 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.4 (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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (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) = 0.1422 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3922 (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) =	0.3334 (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	0.4251	0.4168	0.4084	0.3668	0.3584	0.3167	0.3167	0.3084	0.3334	0.3584	0.3751	0.3918 (22b)
Effective ac	0.5904	0.5868	0.5834	0.5673	0.5642	0.5502	0.5502	0.5476	0.5556	0.5642	0.5703	0.5767 (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 Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			15.5300	1.3258	20.5890		(27)
Ground Floor			42.1800	0.1300	5.4834		(28a)
Brick and Block	100.3000	17.6800	82.6200	0.1800	14.8716		(29a)
Pitched Roof	42.1800		42.1800	0.1300	5.4834		(30)
Total net area of external elements Aum(A, m ²)			184.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.5774		(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)							9.7594 (36)
Total fabric heat loss						(33) + (36) =	58.3368 (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	41.0869	40.8427	40.6033	39.4791	39.2688	38.2896	38.2896	38.1083	38.6668	39.2688	39.6943	40.1392 (38)
Heat transfer coeff	99.4237	99.1795	98.9402	97.8159	97.6056	96.6264	96.6264	96.4451	97.0036	97.6056	98.0311	98.4760 (39)
Average = Sum(39)m / 12 =												97.8149 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1786	1.1757	1.1728	1.1595	1.1570	1.1454	1.1454	1.1433	1.1499	1.1570	1.1621	1.1673 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total = Sum(45)m =		1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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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 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.7699	28.6608	29.5753	25.7845	24.7408	21.3495	19.7834	22.7018	22.9729	26.7727	29.2245	31.7359 (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	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202	127.0202 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7166	18.4003	14.9641	11.3288	8.4684	7.1494	7.7252	10.0415	13.4776	17.1130	19.9733	21.2924 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.3113	230.6804	224.7102	212.0004	195.9565	180.8775	170.8038	168.4346	174.4048	187.1147	203.1586	218.2376 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020	35.7020 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	44.0455	42.6499	39.7518	35.8118	33.2538	29.6520	26.5906	30.5131	31.9068	35.9848	40.5895	42.6558 (72)
Total internal gains	354.1795	352.8367	340.5322	320.2470	298.7848	278.7849	266.2256	270.0953	280.8953	301.3185	324.8275	343.2917 (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				7.8200	10.6334	0.6300	0.7000		0.7700			25.4127 (74)
South				5.8000	46.7521	0.6300	0.7000		0.7700			82.8706 (78)
West				1.9100	19.6403	0.6300	0.7000		0.7700			11.4644 (80)

Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209 (83)
Total gains	473.9272	559.5492	632.8738	702.0636	746.9773	733.4713	700.4885	652.8833	603.6690	532.1276	468.7021	445.5126 (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, nilm (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.9229	59.0680	59.2109	59.8914	60.0205	60.6287	60.6287	60.7427	60.3929	60.0205	59.7599	59.4900
alpha	4.9282	4.9379	4.9474	4.9928	5.0014	5.0419	5.0419	5.0495	5.0262	5.0014	4.9840	4.9660
util living area	0.9985	0.9963	0.9902	0.9686	0.9031	0.7562	0.5867	0.6453	0.8740	0.9808	0.9968	0.9989 (86)
MIT	19.6852	19.8484	20.1042	20.4404	20.7408	20.9289	20.9842	20.9751	20.8422	20.4516	20.0053	19.6579 (87)
Th 2	19.9372	19.9395	19.9418	19.9525	19.9545	19.9639	19.9639	19.9657	19.9603	19.9545	19.9505	19.9462 (88)
util rest of house	0.9980	0.9951	0.9865	0.9561	0.8632	0.6656	0.4588	0.5167	0.8080	0.9708	0.9954	0.9985 (89)
MIT 2	18.7392	18.9036	19.1595	19.4970	19.7757	19.9304	19.9598	19.9584	19.8705	19.5137	19.0694	18.7191 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	18.9556	19.1198	19.3757	19.7128	19.9965	20.1588	20.1942	20.1910	20.0928	19.7283	19.2835	18.9339 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9556	19.1198	19.3757	19.7128	19.9965	20.1588	20.1942	20.1910	20.0928	19.7283	19.2835	18.9339 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9973	0.9937	0.9840	0.9525	0.8651	0.6842	0.4884	0.5464	0.8179	0.9680	0.9942	0.9980 (94)
Ext temp.	472.6638	556.0199	622.7172	668.6923	646.2241	501.8738	342.1263	356.7462	493.7644	515.0800	466.0018	444.6348 (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	1457.1140	1410.3097	1273.9208	1057.6678	809.7831	537.1307	347.2945	365.6219	581.3225	890.9750	1194.3624	1450.9311 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	732.4309	574.0828	484.4955	280.0624	121.6879	0.0000	0.0000	0.0000	0.0000	279.6659	524.4197	748.6845 (98)
Space heating												3745.5295 (98)
Space heating per m2										(98) / (4) =		44.3994 (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	908.2886	715.0357	732.9829	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8537	0.9178	0.8929	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	775.3894	656.2313	654.4922	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	952.5343	912.0054	858.0173	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	127.5443	190.2959	151.4226	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												469.2629 (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	31.8861	47.5740	37.8557	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												117.3157 (107)
Space cooling per m2												1.3907 (108)
Energy for space heating												44.3994 (99)
Energy for space cooling												1.3907 (108)
Total												45.7900 (109)
Target Fabric Energy Efficiency (TFEE)												52.7 (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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
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							0 * 10 =	0.0000 (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) =								0.0000 / (5) =	0.0000 (8)			
Pressure test								Yes				
Measured/design AP50									3.6100			
Infiltration rate									0.1805 (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) =	0.1534 (21)			
Wind speed	Jan 4.7000	Feb 4.4000	Mar 4.4000	Apr 4.0000	May 4.1000	Jun 3.9000	Jul 3.9000	Aug 3.8000	Sep 3.8000	Oct 4.1000	Nov 4.0000	Dec 4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.1803	0.1688	0.1688	0.1534	0.1573	0.1496	0.1496	0.1458	0.1458	0.1573	0.1534	0.1573 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:	0.5000 (23a)											
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)					
Total net area of external elements Aum(A, m2)			184.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.2558			(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)					
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)					
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)					
First Floor Stud			102.7200			9.0000	924.4800 (32c)					
Internal Floor 1			42.1800			18.0000	759.2400 (32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	15716.0444		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0063 (36)					
Total fabric heat loss				(33) + (36) =			60.2621 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7985	Feb 34.7985	Mar 34.7985	Apr 34.7985	May 34.7985	Jun 34.7985	Jul 34.7985	Aug 34.7985	Sep 34.7985	Oct 34.7985	Nov 34.7985	Dec 34.7985 (38)
Heat transfer coeff	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606 (39)
Average = Sum(39)m / 12 =												95.0606 (39)
HLP	Jan 1.1268	Feb 1.1268	Mar 1.1268	Apr 1.1268	May 1.1268	Jun 1.1268	Jul 1.1268	Aug 1.1268	Sep 1.1268	Oct 1.1268	Nov 1.1268	Dec 1.1268 (40)
HLP (average)												1.1268 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)												1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (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	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (64)
RHI water heating demand												1494 (64)
Heat gains from water heating, kWh/month	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.7915	46.0007	37.4103	28.3220	21.1710	17.8735	19.3129	25.1037	33.6941	42.7824	49.9334	53.2309 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7631	344.2991	335.3884	316.4185	292.4724	269.9664	254.9310	251.3950	260.3057	279.2756	303.2217	325.7277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
Total internal gains	568.2891	563.8511	541.7924	507.5419	472.4231	440.9610	422.5611	430.9771	450.6719	485.1382	523.4716	552.5115 (73)

6. Solar gains

[Jan]												
	Area	Solar flux										
	m2	Table 6a										
		W/m2										
North	7.8200	13.4684										
South	5.8000	56.5862										
West	1.9100	25.1733										
Solar gains	147.1844	216.7546	313.9316	415.1272	461.2839	518.8861	475.7477	435.6293	364.0458	261.6359	176.3533	118.8902 (83)
Total gains	715.4735	780.6057	855.7240	922.6691	933.7071	959.8471	898.3088	866.6064	814.7177	746.7741	699.8248	671.4017 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241 (85)
alpha	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616
util living area	0.9713	0.9589	0.9247	0.8460	0.7070	0.4890	0.3460	0.3478	0.6079	0.8491	0.9474	0.9762 (86)
MIT	19.9223	20.0506	20.3238	20.6418	20.8727	20.9783	20.9960	20.9960	20.9481	20.7029	20.2771	19.8802 (87)
Th 2	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790 (88)
util rest of house	0.9643	0.9490	0.9066	0.8095	0.6412	0.3978	0.2406	0.2385	0.5139	0.8036	0.9323	0.9702 (89)
MIT 2	19.0302	19.1548	19.4170	19.7095	19.9016	19.9707	19.9783	19.9783	19.9557	19.7703	19.3774	18.9895 (90)
Living area fraction	19.2343	19.3598	19.6244	19.9228	20.1237	20.2013	20.2111	20.2111	20.1828	19.9837	19.5832	19.1933 (91)
MIT	19.2343	19.3598	19.6244	19.9228	20.1237	20.2013	20.2111	20.2111	20.1828	19.9837	19.5832	19.1933 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2343	19.3598	19.6244	19.9228	20.1237	20.2013	20.2111	20.2111	20.1828	19.9837	19.5832	19.1933 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	685.2878	735.0613	769.4182	744.7791	608.0322	401.4479	237.8998	228.4442	434.8168	600.2986	647.4717	647.4159 (94)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Heat loss rate W	1296.0845	1269.9868	1143.0509	933.7645	667.6816	408.8794	238.7062	229.2052	454.6513	749.4294	1044.0738	1282.6815 (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	454.4327	359.4700	277.9828	136.0695	44.3792	0.0000	0.0000	0.0000	0.0000	110.9534	285.5535	472.6376 (98)
Space heating												2141.4786 (98)
RHI space heating demand												2141 (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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (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					0 * 10 = 0.0000 (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)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.6100
Infiltration rate					0.1805 (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) =	0.1534 (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	0.1956	0.1918	0.1879	0.1688	0.1649	0.1458	0.1458	0.1419	0.1534	0.1649	0.1726	0.1803 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Front Door			2.1500	1.1000	2.3650			(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824			(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200	(28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164	(29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380	(30)					
Total net area of external elements Aum(A, m2)			184.6600					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.2558				(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000	(32)					
Ground Floor Block			28.5200			75.0000	2139.0000	(32c)					
Ground Floor Stud			47.8900			9.0000	431.0100	(32c)					
First Floor Stud			102.7200			9.0000	924.4800	(32c)					
Internal Floor 1			42.1800			18.0000	759.2400	(32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400	(32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		15716.0444	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0063	(36)					
Total fabric heat loss					(33) + (36) =		60.2621	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	(38)
Average = Sum(39)m / 12 =	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	(40)
HLP (average)													(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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total = Sum (45)m =		1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (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	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (64)
Heat gains from water heating, kWh/month	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)
Total per year (kWh/year) = Sum (64)m = 1493.6837 (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	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.7915	46.0007	37.4103	28.3220	21.1710	17.8735	19.3129	25.1037	33.6941	42.7824	49.9334	53.2309 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7631	344.2991	335.3884	316.4185	292.4724	269.9664	254.9310	251.3950	260.3057	279.2756	303.2217	325.7277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
Total internal gains	568.2891	563.8511	541.7924	507.5419	472.4231	440.9610	422.5611	430.9771	450.6719	485.1382	523.4716	552.5115 (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				7.8200	10.6334	0.6300	0.7000	0.7700	25.4127 (74)			
South				5.8000	46.7521	0.6300	0.7000	0.7700	82.8706 (78)			
West				1.9100	19.6403	0.6300	0.7000	0.7700	11.4644 (80)			
Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209 (83)
Total gains	688.0368	770.5636	834.1340	889.3585	920.6157	895.6473	856.8240	813.7652	773.4456	715.9473	667.3461	654.7324 (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	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241
alpha	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616
util living area	0.9807	0.9684	0.9443	0.8904	0.7859	0.6265	0.4742	0.5165	0.7314	0.9076	0.9681	0.9840 (86)
MIT	19.7208	19.9009	20.1721	20.4978	20.7749	20.9338	20.9833	20.9762	20.8736	20.5251	20.0536	19.6647 (87)
Th 2	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790 (88)
util rest of house	0.9762	0.9612	0.9311	0.8639	0.7351	0.5442	0.3705	0.4109	0.6562	0.8795	0.9594	0.9803 (89)
MIT 2	18.8314	19.0080	19.2717	19.5797	19.8244	19.9454	19.9737	19.9708	19.9070	19.6119	19.1605	18.7763 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	19.0349	19.2123	19.4777	19.7897	20.0419	20.1716	20.2047	20.2009	20.1282	19.8208	19.3648	18.9795 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0349	19.2123	19.4777	19.7897	20.0419	20.1716	20.2047	20.2009	20.1282	19.8208	19.3648	18.9795 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9709	0.9543	0.9234	0.8582	0.7385	0.5606	0.3941	0.4347	0.6682	0.8744	0.9529	0.9755 (94)
Ext temp.	667.9810	735.3860	770.1991	763.2757	679.8797	502.0837	337.6423	353.7612	516.7934	625.9928	635.8822	638.6638 (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	1400.7098	1360.5357	1233.6676	1035.1857	792.9835	529.6364	342.6620	361.3112	573.0402	876.5385	1165.9002	1404.9520 (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	545.1502	420.1006	344.8206	195.7752	84.1492	0.0000	0.0000	0.0000	0.0000	186.4060	381.6129	570.1184 (98)
Space heating per m2												2728.1332 (98)
(98) / (4) =												32.3392 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3024.5379 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	545.1502	420.1006	344.8206	195.7752	84.1492	0.0000	0.0000	0.0000	0.0000	186.4060	381.6129	570.1184	(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)	604.3794	465.7435	382.2845	217.0457	93.2918	0.0000	0.0000	0.0000	0.0000	206.6585	423.0742	632.0603	(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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948	(64)
Efficiency of water heater (217)m	86.7338	86.3946	85.7332	84.3549	81.6272	76.4000	76.4000	76.4000	76.4000	84.0606	86.0680	76.4000	(216)
Fuel for water heating, kWh/month	178.5715	156.8166	163.0430	144.4429	143.2035	132.0061	122.3231	140.3913	142.0921	150.5293	160.5078	172.5478	(219)
Water heating fuel used												1806.4751	(219)
Annual totals kWh/year													
Space heating fuel - main system												3024.5379	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													61.2369 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													136.2369 (231)
Electricity for lighting (calculated in Appendix L)													365.8614 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.74 * 1068 * 1.00) =										-632.2977			-632.2977 (233)
Total delivered energy for all uses													4700.8136 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3024.5379	3.4800	105.2539 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1806.4751	3.4800	62.8653 (247)
Mechanical ventilation fans	61.2369	13.1900	8.0772 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	365.8614	13.1900	48.2571 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-632.2977	13.1900	-83.4001 (252)
Total energy cost			270.9460 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.8797 (257)
SAP rating (Section 12)		87.7283
SAP band		88 (258)
		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	3024.5379	0.2160	653.3002 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1806.4751	0.2160	390.1986 (264)
Space and water heating			1043.4988 (265)
Pumps and fans	136.2369	0.5190	70.7070 (267)
Energy for lighting	365.8614	0.5190	189.8821 (268)
Energy saving/generation technologies			
PV Unit	-632.2977	0.5190	-328.1625 (269)
Total kg/year			975.9253 (272)
CO2 emissions per m2			11.5700 (273)
EI value			89.8907
EI rating			90 (274)

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EI band

B

Calculation of stars for heating and DHW	

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	$3.48 / 0.8229 = 4.229$, stars = 4
Water heating environmental impact	$0.216 / 0.8229 = 0.2625$, 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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour			
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											0 * 10 =	0.0000 (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) =											Air changes per hour		
Pressure test											0.0000 / (5) =		0.0000 (8)
Measured/design AP50											Yes		
Infiltration rate													3.6100
Number of sides sheltered													0.1805 (18)
													2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.1534 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)	
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)	
Adj infilt rate													
	0.1803	0.1688	0.1688	0.1534	0.1573	0.1496	0.1496	0.1458	0.1458	0.1573	0.1534	0.1573 (22b)	
Mechanical extract ventilation - centralised													
If mechanical ventilation:													0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)					
Total net area of external elements Aum(A, m2)			184.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.2558			(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)					
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)					
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)					
First Floor Stud			102.7200			9.0000	924.4800 (32c)					
Internal Floor 1			42.1800			18.0000	759.2400 (32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =	15716.0444	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0063 (36)					
Total fabric heat loss					(33) + (36) =		60.2621 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7985	Feb 34.7985	Mar 34.7985	Apr 34.7985	May 34.7985	Jun 34.7985	Jul 34.7985	Aug 34.7985	Sep 34.7985	Oct 34.7985	Nov 34.7985	Dec 34.7985 (38)
Heat transfer coeff	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606 (39)
Average = Sum(39)m / 12 =												95.0606 (39)
HLP	Jan 1.1268	Feb 1.1268	Mar 1.1268	Apr 1.1268	May 1.1268	Jun 1.1268	Jul 1.1268	Aug 1.1268	Sep 1.1268	Oct 1.1268	Nov 1.1268	Dec 1.1268 (40)
HLP (average)												1.1268 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total =	Sum (45)m =	1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (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	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (64)
Heat gains from water heating, kWh/month	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.7915	46.0007	37.4103	28.3220	21.1710	17.8735	19.3129	25.1037	33.6941	42.7824	49.9334	53.2309 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7631	344.2991	335.3884	316.4185	292.4724	269.9664	254.9310	251.3950	260.3057	279.2756	303.2217	325.7277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
Total internal gains	568.2891	563.8511	541.7924	507.5419	472.4231	440.9610	422.5611	430.9771	450.6719	485.1382	523.4716	552.5115 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c			Access factor Table 6d	Gains W	
North				7.8200	13.4684	0.6300	0.7000			0.7700	32.1881 (74)	
South				5.8000	56.5862	0.6300	0.7000			0.7700	100.3022 (78)	
West				1.9100	25.1733	0.6300	0.7000			0.7700	14.6942 (80)	

Solar gains	147.1844	216.7546	313.9316	415.1272	461.2839	518.8861	475.7477	435.6293	364.0458	261.6359	176.3533	118.8902 (83)
Total gains	715.4735	780.6057	855.7240	922.6691	933.7071	959.8471	898.3088	866.6064	814.7177	746.7741	699.8248	671.4017 (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	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241
alpha	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616
util living area	0.9713	0.9589	0.9247	0.8460	0.7070	0.4890	0.3460	0.3478	0.6079	0.8491	0.9474	0.9762 (86)
MIT	19.9223	20.0506	20.3238	20.6418	20.8727	20.9783	20.9960	20.9960	20.9481	20.7029	20.2771	19.8802 (87)
Th 2	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790 (88)
util rest of house	0.9643	0.9490	0.9066	0.8095	0.6412	0.3978	0.2406	0.2385	0.5139	0.8036	0.9323	0.9702 (89)
MIT 2	19.0302	19.1548	19.4170	19.7095	19.9016	19.9707	19.9783	19.9783	19.9557	19.7703	19.3774	18.9895 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	19.2343	19.3598	19.6244	19.9228	20.1237	20.2013	20.2111	20.2111	20.1828	19.9837	19.5832	19.1933 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2343	19.3598	19.6244	19.9228	20.1237	20.2013	20.2111	20.2111	20.1828	19.9837	19.5832	19.1933 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9578	0.9417	0.8991	0.8072	0.6512	0.4182	0.2648	0.2636	0.5337	0.8039	0.9252	0.9643 (94)
Ext temp.	685.2878	735.0613	769.4182	744.7791	608.0322	401.4479	237.8998	228.4442	434.8168	600.2986	647.4717	647.4159 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1296.0845	1269.9868	1143.0509	933.7645	667.6816	408.8794	238.7062	229.2052	454.6513	749.4294	1044.0738	1282.6815 (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	454.4327	359.4700	277.9828	136.0695	44.3792	0.0000	0.0000	0.0000	0.0000	110.9534	285.5535	472.6376 (98)
Space heating per m2												2141.4786 (98)
										(98) / (4) =		25.3850 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2374.1448 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	454.4327	359.4700	277.9828	136.0695	44.3792	0.0000	0.0000	0.0000	0.0000	110.9534	285.5535	472.6376	(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)	503.8057	398.5255	308.1849	150.8531	49.2008	0.0000	0.0000	0.0000	0.0000	123.0082	316.5782	523.9885	(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	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948	(64)
Efficiency of water heater (217)m	86.2404	85.9504	85.0592	83.1081	79.7579	76.4000	76.4000	76.4000	76.4000	82.2813	85.1833	76.4000	(216)
Fuel for water heating, kWh/month	179.5932	157.6270	164.3348	146.6098	146.5598	132.0061	122.3231	140.3913	142.0921	153.7844	162.1748	173.5273	(219)
Water heating fuel used												1821.0239	(219)
Annual totals kWh/year													
Space heating fuel - main system												2374.1448	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													61.2369 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													136.2369 (231)
Electricity for lighting (calculated in Appendix L)													365.8614 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.74 * 1184 * 1.00) =										-700.8788			-700.8788 (233)
Total delivered energy for all uses													3996.3882 (238)

10a. Fuel costs - using BEDF prices (£550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2374.1448	7.3800	175.2119 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1821.0239	7.3800	134.3916 (247)
Mechanical ventilation fans	61.2369	28.6600	17.5505 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Energy for lighting	365.8614	28.6600	104.8559 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-700.8788	28.6600	-200.8719 (252)
Total energy cost			359.6330 (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	2374.1448	0.2160	512.8153 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1821.0239	0.2160	393.3412 (264)
Space and water heating			906.1564 (265)
Pumps and fans	136.2369	0.5190	70.7070 (267)
Energy for lighting	365.8614	0.5190	189.8821 (268)
Energy saving/generation technologies			
PV Unit	-700.8788	0.5190	-363.7561 (269)
Total kg/year			802.9894 (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	2374.1448	1.2200	2896.4567 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1821.0239	1.2200	2221.6491 (264)
Space and water heating			5118.1058 (265)
Pumps and fans	136.2369	3.0700	418.2474 (267)
Energy for lighting	365.8614	3.0700	1123.1946 (268)

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Energy saving/generation technologies
PV Unit -700.8788 3.0700 -2151.6980 (269)
Primary energy kWh/year 4507.8497 (272)
Primary energy kWh/m2/year 53.4359 (273)

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	+ 1.3	-£ 64	-204 kg (25.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£64 2.42 kg/m²	B 89	A 92
Total Savings	£64 2.42 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 550 TEST (28 Jun 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£144	£158	-£14
Mains gas	£417	£338	£78
Space heating	£321	£321	£0
Water heating	£134	£70	£64
Lighting	£105	£105	£0
Generated (PV)	-£201	-£201	£0
Total cost of fuels	£360	£295	£64
Total cost of uses	£359	£295	£64
Delivered energy	47 kWh/m²	35 kWh/m²	12 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	53 kWh/m²	40 kWh/m²	14 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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (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					0 * 10 = 0.0000 (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)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.6100
Infiltration rate					0.1805 (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) =	0.1534 (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	0.1956	0.1918	0.1879	0.1688	0.1649	0.1458	0.1458	0.1419	0.1534	0.1649	0.1726	0.1803 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)					
Total net area of external elements Aum(A, m2)			184.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		49.2558		(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)					
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)					
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)					
First Floor Stud			102.7200			9.0000	924.4800 (32c)					
Internal Floor 1			42.1800			18.0000	759.2400 (32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		15716.0444 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0063 (36)					
Total fabric heat loss						(33) + (36) =	60.2621 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985	34.7985 (38)
Average = Sum(39)m / 12 =	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268	1.1268 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total = Sum(45)m =		1487.3969 (45)
Distribution loss (46)m = 0.15 x (45)m												
23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (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	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month												
154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (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												1.2193 (H8)
Utilisation factor												0.5596 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.5346 (H14)
Volume ratio Veff/V												0.7934 (H15)
Solar storage volume factor												0.9537 (H16)
Solar input												-851.1157 (H17)
Solar input	-24.6807	-41.1849	-70.1426	-94.0050	-116.1352	-114.1794	-112.6705	-98.4408	-77.0989	-52.6494	-29.2748	-20.6535 (63)
										Solar input (sum of months) = Sum(63)m =		-851.1157 (63)
Output from w/h												
130.2012	94.2961	69.6393	27.8397	0.7578	0.0000	0.0000		8.8182	31.4595	73.8863	108.8710	129.3413 (64)
										Total per year (kWh/year) = Sum(64)m =		675.1104 (64)
Heat gains from water heating, kWh/month												
51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.7915	46.0007	37.4103	28.3220	21.1710	17.8735	19.3129	25.1037	33.6941	42.7824	49.9334	53.2309 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.7631	344.2991	335.3884	316.4185	292.4724	269.9664	254.9310	251.3950	260.3057	279.2756	303.2217	325.7277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828 (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)	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
Total internal gains	568.2891	563.8511	541.7924	507.5419	472.4231	440.9610	422.5611	430.9771	450.6719	485.1382	523.4716	552.5115 (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				7.8200	10.6334	0.6300	0.7000	0.7700	25.4127 (74)			
South				5.8000	46.7521	0.6300	0.7000	0.7700	82.8706 (78)			
West				1.9100	19.6403	0.6300	0.7000	0.7700	11.4644 (80)			
Solar gains	119.7477	206.7125	292.3417	381.8166	448.1925	454.6863	434.2629	382.7881	322.7737	230.8091	143.8746	102.2209 (83)
Total gains	688.0368	770.5636	834.1340	889.3585	920.6157	895.6473	856.8240	813.7652	773.4456	715.9473	667.3461	654.7324 (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	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241 (86)
alpha	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616 (86)
util living area	0.9807	0.9684	0.9443	0.8904	0.7859	0.6265	0.4742	0.5165	0.7314	0.9076	0.9681	0.9840 (86)
MIT	19.7208	19.9009	20.1721	20.4978	20.7749	20.9338	20.9833	20.9762	20.8736	20.5251	20.0536	19.6647 (87)
Th 2	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790 (88)
util rest of house	0.9762	0.9612	0.9311	0.8639	0.7351	0.5442	0.3705	0.4109	0.6562	0.8795	0.9594	0.9803 (89)
MIT 2	18.8314	19.0080	19.2717	19.5797	19.8244	19.9454	19.9737	19.9708	19.9070	19.6119	19.1605	18.7763 (90)
Living area fraction									fLA = Living area / (4) =			0.2288 (91)
MIT	19.0349	19.2123	19.4777	19.7897	20.0419	20.1716	20.2047	20.2009	20.1282	19.8208	19.3648	18.9795 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0349	19.2123	19.4777	19.7897	20.0419	20.1716	20.2047	20.2009	20.1282	19.8208	19.3648	18.9795 (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	0.9709	0.9543	0.9234	0.8582	0.7385	0.5606	0.3941	0.4347	0.6682	0.8744	0.9529	0.9755	(94)
Useful gains	667.9810	735.3860	770.1991	763.2757	679.8797	502.0837	337.6423	353.7612	516.7934	625.9928	635.8822	638.6638	(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	1400.7098	1360.5357	1233.6676	1035.1857	792.9835	529.6364	342.6620	361.3112	573.0402	876.5385	1165.9002	1404.9520	(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	545.1502	420.1006	344.8206	195.7752	84.1492	0.0000	0.0000	0.0000	0.0000	186.4060	381.6129	570.1184	(98)
Space heating												2728.1332	(98)
Space heating per m2											(98) / (4) =	32.3392	(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													3024.5379 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	545.1502	420.1006	344.8206	195.7752	84.1492	0.0000	0.0000	0.0000	0.0000	186.4060	381.6129	570.1184	(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)	604.3794	465.7435	382.2845	217.0457	93.2918	0.0000	0.0000	0.0000	0.0000	206.6585	423.0742	632.0603	(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	130.2012	94.2961	69.6393	27.8397	0.7578	0.0000	0.0000	8.8182	31.4595	73.8863	108.8710	129.3413	(64)
Efficiency of water heater (217)m	87.1646	87.3091	87.5431	88.2162	90.0548	76.4000	76.4000	76.4000	76.4000	85.8007	86.7230	76.4000	(216)
Fuel for water heating, kWh/month	149.3738	108.0027	79.5486	31.5585	0.8415	0.0000	0.0000	11.5422	41.1774	86.1139	125.5388	148.1834	(219)
Water heating fuel used												781.8807	(219)
Annual totals kWh/year													
Space heating fuel - main system												3024.5379	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													61.2369 (230a)
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													186.2369 (231)
Electricity for lighting (calculated in Appendix L)													365.8614 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.74 * 1068 * 1.00) =										-632.2977		-632.2977	(233)
Total delivered energy for all uses												3726.2192	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3024.5379	3.4800	105.2539 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	781.8807	3.4800	27.2094 (247)
Mechanical ventilation fans	61.2369	13.1900	8.0772 (249)
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	365.8614	13.1900	48.2571 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-632.2977	13.1900	-83.4001 (252)
Total energy cost			241.8851 (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] =	0.7853 (257)
SAP value		89.0445
SAP rating (Section 12)		89 (258)
SAP band		B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	3024.5379	0.2160	653.3002 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	781.8807	0.2160	168.8862 (264)
Space and water heating			822.1864 (265)
Pumps and fans	186.2369	0.5190	96.6570 (267)
Energy for lighting	365.8614	0.5190	189.8821 (268)
Energy saving/generation technologies			
PV Unit	-632.2977	0.5190	-328.1625 (269)
Total kg/year			780.5629 (272)
CO2 emissions per m2			9.2500 (273)
EI value			91.9144
EI rating			92 (274)
EI band			A

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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	42.1800 (1b)	x 2.3900 (2b)	= 100.8102 (1b) - (3b)
First floor	42.1800 (1c)	x 2.6100 (2c)	= 110.0898 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.9000 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour	
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											0 * 10 =	0.0000 (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) =												0.0000 / (5) =	0.0000 (8)
Pressure test											Yes		
Measured/design AP50												3.6100	
Infiltration rate												0.1805 (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) =			0.1534 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)	
Adj infilt rate	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)	
	0.1803	0.1688	0.1688	0.1534	0.1573	0.1496	0.1496	0.1458	0.1458	0.1573	0.1534	0.1573 (22b)	
Mechanical extract ventilation - centralised													
If mechanical ventilation:												0.5000 (23a)	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			15.5300	1.1450	17.7824		(27)					
Ground Floor			42.1800	0.1200	5.0616	84.0000	3543.1200 (28a)					
Brick and Block	100.3000	17.6800	82.6200	0.2400	19.8288	42.2200	3488.2164 (29a)					
Pitched Roof	42.1800		42.1800	0.1000	4.2180	9.1000	383.8380 (30)					
Total net area of external elements Aum(A, m2)			184.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	49.2558			(33)					
Party Wall 1			29.8900	0.0000	0.0000	110.0000	3287.9000 (32)					
Ground Floor Block			28.5200			75.0000	2139.0000 (32c)					
Ground Floor Stud			47.8900			9.0000	431.0100 (32c)					
First Floor Stud			102.7200			9.0000	924.4800 (32c)					
Internal Floor 1			42.1800			18.0000	759.2400 (32d)					
Internal Ceiling 1			42.1800			18.0000	759.2400 (32e)					
Heat capacity Cm = Sum(A x k)				(28) ... (30) + (32) + (32a) ... (32e) =	15716.0444		(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							186.2973 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0063 (36)					
Total fabric heat loss				(33) + (36) =	60.2621		(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7985	Feb 34.7985	Mar 34.7985	Apr 34.7985	May 34.7985	Jun 34.7985	Jul 34.7985	Aug 34.7985	Sep 34.7985	Oct 34.7985	Nov 34.7985	Dec 34.7985 (38)
Heat transfer coeff	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606	95.0606 (39)
Average = Sum(39)m / 12 =												95.0606 (39)
HLP	Jan 1.1268	Feb 1.1268	Mar 1.1268	Apr 1.1268	May 1.1268	Jun 1.1268	Jul 1.1268	Aug 1.1268	Sep 1.1268	Oct 1.1268	Nov 1.1268	Dec 1.1268 (40)
HLP (average)												1.1268 (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												2.5404 (42)
Average daily hot water use (litres/day)												94.5346 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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Calculation Type: New Build (As Built)

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

Daily hot water use	103.9880	100.2066	96.4253	92.6439	88.8625	85.0811	85.0811	88.8625	92.6439	96.4253	100.2066	103.9880 (44)
Energy conte	154.2112	134.8741	139.1780	121.3388	116.4274	100.4680	93.0984	106.8318	108.1077	125.9891	137.5269	149.3454 (45)
Energy content (annual)										Total = Sum(45)m =		1487.3969 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.1317	20.2311	20.8767	18.2008	17.4641	15.0702	13.9648	16.0248	16.2162	18.8984	20.6290	22.4018 (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	0.6706	0.6069	0.6039	0.5059	0.4656	0.3847	0.3564	0.4272	0.4507	0.5467	0.6188	0.6494 (61)
Total heat required for water heating calculated for each month												
	154.8818	135.4810	139.7819	121.8446	116.8930	100.8527	93.4548	107.2590	108.5584	126.5358	138.1458	149.9948 (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												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3622 (H8)
Utilisation factor												0.5201 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.5346 (H14)
Volume ratio Veff/V												0.7934 (H15)
Solar storage volume factor												0.9537 (H16)
Solar input												-883.6320 (H17)
Solar input	-28.8340	-41.0052	-71.1546	-95.7150	-111.2273	-120.9830	-114.7104	-104.6047	-81.8739	-56.5883	-34.1041	-22.8312 (63)
										Solar input (sum of months) = Sum(63)m =		-883.6320 (63)
Output from w/h												
	126.0478	94.4758	68.6273	26.1296	5.6657	0.0000	0.0000	2.6542	26.6845	69.9475	104.0417	127.1635 (64)
										Total per year (kWh/year) = Sum(64)m =		651.4376 (64)
Heat gains from water heating, kWh/month												
	51.4429	44.9974	46.4277	40.4716	38.8285	33.5018	31.0443	35.6284	36.0585	42.0280	45.8824	49.8197 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242	152.4242 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	51.7915	46.0007	37.4103	28.3220	21.1710	17.8735	19.3129	25.1037	33.6941	42.7824	49.9334	53.2309 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	340.7631	344.2991	335.3884	316.4185	292.4724	269.9664	254.9310	251.3950	260.3057	279.2756	303.2217	325.7277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828	52.7828 (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)												
	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161	-101.6161 (71)
Water heating gains (Table 5)												
	69.1437	66.9604	62.4028	56.2106	52.1889	46.5303	41.7262	47.8876	50.0812	56.4893	63.7256	66.9619 (72)
Total internal gains												
	568.2891	563.8511	541.7924	507.5419	472.4231	440.9610	422.5611	430.9771	450.6719	485.1382	523.4716	552.5115 (73)

6. Solar gains

[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	or Table 6c							
North	7.8200	13.4684	0.6300	0.7000	0.7700	32.1881 (74)						
South	5.8000	56.5862	0.6300	0.7000	0.7700	100.3022 (78)						
West	1.9100	25.1733	0.6300	0.7000	0.7700	14.6942 (80)						
Solar gains	147.1844	216.7546	313.9316	415.1272	461.2839	518.8861	475.7477	435.6293	364.0458	261.6359	176.3533	118.8902 (83)
Total gains	715.4735	780.6057	855.7240	922.6691	933.7071	959.8471	898.3088	866.6064	814.7177	746.7741	699.8248	671.4017 (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	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241	45.9241
alpha	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616	4.0616
util living area												
	0.9713	0.9589	0.9247	0.8460	0.7070	0.4890	0.3460	0.3478	0.6079	0.8491	0.9474	0.9762 (86)
MIT	19.9223	20.0506	20.3238	20.6418	20.8727	20.9783	20.9960	20.9960	20.9481	20.7029	20.2771	19.8802 (87)
Th 2	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790	19.9790 (88)
util rest of house												
	0.9643	0.9490	0.9066	0.8095	0.6412	0.3978	0.2406	0.2385	0.5139	0.8036	0.9323	0.9702 (89)
MIT 2	19.0302	19.1548	19.4170	19.7095	19.9016	19.9707	19.9783	19.9783	19.9557	19.7703	19.3774	18.9895 (90)
Living area fraction												
MIT	19.2343	19.3598	19.6244	19.9228	20.1237	20.2013	20.2111	20.2111	20.1828	19.9837	19.5832	19.1933 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2343	19.3598	19.6244	19.9228	20.1237	20.2013	20.2111	20.2111	20.1828	19.9837	19.5832	19.1933 (93)

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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	0.9578	0.9417	0.8991	0.8072	0.6512	0.4182	0.2648	0.2636	0.5337	0.8039	0.9252	0.9643	(94)
Useful gains	685.2878	735.0613	769.4182	744.7791	608.0322	401.4479	237.8998	228.4442	434.8168	600.2986	647.4717	647.4159	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	1296.0845	1269.9868	1143.0509	933.7645	667.6816	408.8794	238.7062	229.2052	454.6513	749.4294	1044.0738	1282.6815	(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	454.4327	359.4700	277.9828	136.0695	44.3792	0.0000	0.0000	0.0000	0.0000	110.9534	285.5535	472.6376	(98)
Space heating												2141.4786	(98)
Space heating per m2											(98) / (4) =	25.3850	(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													2374.1448 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	454.4327	359.4700	277.9828	136.0695	44.3792	0.0000	0.0000	0.0000	0.0000	110.9534	285.5535	472.6376	(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)	503.8057	398.5255	308.1849	150.8531	49.2008	0.0000	0.0000	0.0000	0.0000	123.0082	316.5782	523.9885	(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	126.0478	94.4758	68.6273	26.1296	5.6657	0.0000	0.0000	2.6542	26.6845	69.9475	104.0417	127.1635	(64)
Efficiency of water heater (217)m	86.7957	86.9320	87.0855	87.6495	88.3924	76.4000	76.4000	76.4000	76.4000	84.3115	86.0493	76.4000	(216)
Fuel for water heating, kWh/month	145.2236	108.6778	78.8045	29.8115	6.4097	0.0000	0.0000	3.4741	34.9273	82.9631	120.9094	146.3783	(219)
Water heating fuel used												757.5794	(219)
Annual totals kWh/year													
Space heating fuel - main system												2374.1448	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)													61.2369 (230a)
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													186.2369 (231)
Electricity for lighting (calculated in Appendix L)													365.8614 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.74 * 1184 * 1.00) =										-700.8788		-700.8788	(233)
Total delivered energy for all uses												2982.9438	(238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2374.1448	7.3800	175.2119	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	757.5794	7.3800	55.9094	(247)
Mechanical ventilation fans	61.2369	28.6600	17.5505	(249)
Pumps and fans for heating	75.0000	28.6600	21.4950	(249)
Pump for solar water heating	50.0000	28.6600	14.3300	(249)
Energy for lighting	365.8614	28.6600	104.8559	(250)
Additional standing charges			107.0000	(251)
Energy saving/generation technologies				
PV Unit	-700.8788	28.6600	-200.8719	(252)
Total energy cost			295.4808	(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	2374.1448	0.2160	512.8153	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	757.5794	0.2160	163.6372	(264)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space and water heating			676.4524 (265)
Pumps and fans	186.2369	0.5190	96.6570 (267)
Energy for lighting	365.8614	0.5190	189.8821 (268)
Energy saving/generation technologies			
PV Unit	-700.8788	0.5190	-363.7561 (269)
Total kg/year			599.2354 (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	2374.1448	1.2200	2896.4567 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	757.5794	1.2200	924.2469 (264)
Space and water heating			3820.7036 (265)
Pumps and fans	186.2369	3.0700	571.7474 (267)
Energy for lighting	365.8614	3.0700	1123.1946 (268)
Energy saving/generation technologies			
PV Unit	-700.8788	3.0700	-2151.6980 (269)
Primary energy kWh/year			3363.9475 (272)
Primary energy kWh/m2/year			39.8761 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 30	Issued on Date	11/07/2024
Assessment Reference	As Built	Prop Type Ref	Type F
Project	4, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.42	TER	18.25
Environmental	90 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.80	DFEE	45.38	TFEE	52.66
General Requirements Compliance	Pass	% DFEE<TFEE	13.82		

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 (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
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	700	1000
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: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 30	Issued on Date	11/07/2024
Assessment Reference	As Built	Prop Type Ref	Type F
Project	4, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.42	TER	18.25
Environmental	90 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.80	DFEE	45.38	TFEE	52.66
General Requirements Compliance	Pass	% DFEE<TFEE	13.82		

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

Wall 000001

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 0943 Plot 30	Issued on Date	11/07/2024
Assessment Reference	As Built	Prop Type Ref	Type F
Project	4, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.42	TER	18.25
Environmental	90 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.80	DFEE	45.38	TFEE	52.66
General Requirements Compliance	Pass	% DFEE<TFEE	13.82		

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 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 34.96 m², Perimeter = 16.87 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

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	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene,1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 6.953 m² K/W Lower limit = 6.953 m² K/W Average = 6.953 m² K/W

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 30			Issued on Date	11/07/2024
Assessment Reference	As Built	Prop Type Ref	Type F		
Property	4, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	13.42	TER	18.25
Environmental	90 B	% DER<TER	26.48		
CO ₂ Emissions (t/year)	0.80	DFEE	45.38	TFEE	52.66
General Requirements Compliance	Pass	% DFEE<TFEE	13.82		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	South						
Property Tenure	Unknown						
Transaction Type	New dwelling						
Terrain Type	Suburban						
1.0 Property Type	House, Semi-Detached						
2.0 Number of Storeys	2						
3.0 Date Built	2023						
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:		20.06 m		42.18 m²		2.39 m	
1st Storey:		20.06 m		42.18 m²		2.61 m	
7.0 Living Area	19.30			m²			
8.0 Thermal Mass Parameter	Precise calculation						
Thermal Mass	186.3			kJ/m²K			
9.0 External Walls							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Brick and Block	Cavity Wall	Other		0.24	42.22	100.30	82.62
9.1 Party Walls							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	
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	29.89	
9.2 Internal Walls							
Description	Construction				Kappa (kJ/m²K)	Area (m²)	
Ground Floor Block	Dense block, plasterboard on dabs				75.00	28.52	
Ground Floor Stud	Plasterboard on timber frame				9.00	47.89	
First Floor Stud	Plasterboard on timber frame				9.00	102.72	
10.0 External Roofs							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Other		0.10	9.10	42.18	42.18

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.18

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	42.18

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.18

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	South							2.15	
Front Elevation	Window	[1] Brick and Block	South	None	0.00					5.80	
Side Elevation	Window	[1] Brick and Block	West	None	0.00					1.91	
Rear Elevation	Window	[1] Brick and Block	North	None	0.00					7.82	

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)	2.84	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	8.74	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E3 Sill	10.55	0.021	No	Knauf P5
Independently assessed	E4 Jamb	29.10	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	20.06	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	20.06	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	14.06	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	6.02	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	10.00	0.039	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	10.00	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	6.02	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	6.02	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	6.02	0.035	No	Knauf P29 Halved

Y-value	0.060	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	5.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	Yes	
	3.61	m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	3
Manufacturer SFP	0.17
Duct Type	Rigid
Wet Rooms	3

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				0
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	21	
Total number of L.E.L. fittings	21	
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	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17960	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.2	
Controls	76.4	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
	Balanced	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
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
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.74	South	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£64	B 89	