



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 9 Shaw Road, West End
Southampton, SO30 3JZ

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
tobiaswhiting26@gmail.com

Report Issue Date: 01/03/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 71	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	Sh
Property	9 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	88 B	DER	12.97
Environmental	90 B	TER	18.31
CO ₂ Emissions (t/year)	0.79	% DER<TER	29.16
General Requirements Compliance	Pass	DFEE	41.25
		TFEE	53.21
		% DFEE<TFEE	22.47
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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)	18.31	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.97	kgCO ₂ /m ²	Pass
	-5.34 (-29.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.21	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	41.25	kWh/m ² /yr	
	-11.9 (-22.4%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (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	3.95 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.31

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

6.94 m², No overhang

Windows facing East

5.40 m², No overhang

Windows facing South

4.43 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

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.95 (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
Thermal bridging ψ -value	0.035	W/m ² K
Air permeability	4.0	m ³ /m ² h
Photovoltaic array	0.73	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Assessment Reference	As Built	Prop Type Ref	Sh
Property	9 Shaw Road, West End, Southampton, SO30 3JZ		

SAP Rating	88 B	DER	12.97	TER	18.31
Environmental	90 B	% DER<TER	29.16		
CO ₂ Emissions (t/year)	0.79	DFEE	41.25	TFEE	53.21
General Requirements Compliance	Pass	% DFEE<TFEE	22.47		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	1.91	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	11.44	0.49	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.060	1.51	0.09	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.034	12.34	0.42	CD0027
External wall	E4 Jamb	Independently assessed	0.039	30.30	1.18	CD0028
External wall	E5 Ground floor (normal)	Independently assessed	0.037	27.54	1.02	Knauf P7
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	27.54	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	18.62	1.12	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.92	0.48	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	20.20	1.01	CD0035

Total: **5.91** W/mK:
Y-Value: **0.035** W/m²K:

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Detached House, total floor area 83 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) 18.31 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.97 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)41.3 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: 3.95 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system
Specific fan power: 0.31
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average
Windows facing North: 6.94 m², No overhang
Windows facing East: 5.40 m², No overhang
Windows facing South: 4.43 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
Thermal bridging y-value 0.035 W/m²K
Air permeability 4.0 m³/m²h
Photovoltaic array 0.73 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.6500 (1b)	x 2.3900 (2b)	= 99.5435 (1b) - (3b)
First floor	41.6500 (1c)	x 2.6700 (2c)	= 111.2055 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.7490 (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											3.9500	
Infiltration rate											0.1975 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1827 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.2329	0.2284	0.2238	0.2010	0.1964	0.1736	0.1736	0.1690	0.1827	0.1964	0.2055	0.2147 (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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.6500	0.1200	4.9980	84.0000	3498.6000 (28a)
Brick and Block	85.9500	18.8900	67.0600	0.2400	16.0944	42.2200	2831.2732 (29a)
Pitched Roof	41.6500		41.6500	0.1000	4.1650	9.1000	379.0150 (30)
Total net area of external elements Aum(A, m ²)			169.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7917		(33)
GF Stud			27.5200			9.0000	247.6800 (32c)
First Floor			98.6600			9.0000	887.9400 (32c)
GF Block			43.2200			75.0000	3241.5000 (32c)
Internal Floor 1			41.6500			18.0000	749.7000 (32d)
Internal Ceiling 1			41.6500			18.0000	749.7000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12585.4082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							151.0853 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9129 (36)
Total fabric heat loss						(33) + (36) =	52.7046 (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	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736 (38)
Heat transfer coeff	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781 (39)
Average = Sum(39)m / 12 =												87.4781 (39)
HLP	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502 (40)
HLP (average)												1.0502 (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	2.5225 (42)
Average daily hot water use (litres/day)	94.1094 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	103.5203	99.7559	95.9916	92.2272	88.4628	84.6984	84.6984	88.4628	92.2272	95.9916	99.7559	103.5203 (44)
Energy content (annual)	153.5176	134.2675	138.5520	120.7930	115.9038	100.0162	92.6797	106.3513	107.6214	125.4224	136.9084	148.6736 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1480.7069 (45)
	23.0276	20.1401	20.7828	18.1190	17.3856	15.0024	13.9019	15.9527	16.1432	18.8134	20.5363	22.3010 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5588	24.8884	27.5290	26.6116	27.4772	26.5662	27.4364	27.4629	26.5909	27.5076	26.6544	27.5507 (61)
Total heat required for water heating calculated for each month	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244 (64)
Heat gains from water heating, kWh/month	57.9343	50.8660	52.9508	46.8166	45.4073	39.8969	37.6751	42.2275	42.4319	48.5799	52.1856	56.3217 (65)
										Total per year (kWh/year) = Sum (64)m =		1804.5412 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.2942	18.0251	14.6590	11.0978	8.2958	7.0036	7.5677	9.8367	13.2028	16.7640	19.5661	20.8582 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.1990	228.5463	222.6313	210.0390	194.1436	179.2041	169.2236	166.8763	172.7913	185.3836	201.2790	216.2185 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125 (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)	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000 (71)
Water heating gains (Table 5)	77.8687	75.6935	71.1704	65.0230	61.0313	55.4124	50.6386	56.7574	58.9331	65.2955	72.4800	75.7012 (72)
Total internal gains	388.1994	386.1024	372.2983	349.9974	327.3082	305.4576	291.2673	297.3080	308.7648	331.2806	357.1627	376.6154 (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				6.9400	10.6334	0.6300	0.7000	0.7700	22.5529 (74)			
East				5.4000	19.6403	0.6300	0.7000	0.7700	32.4125 (76)			
South				4.4300	46.7521	0.6300	0.7000	0.7700	63.2960 (78)			
Solar gains	118.2615	210.1682	309.7051	419.1709	500.6267	510.3695	486.5135	423.9164	347.4393	238.3508	143.2639	100.1493 (83)
Total gains	506.4609	596.2706	682.0034	769.1683	827.9348	815.8271	777.7808	721.2244	656.2041	569.6314	500.4266	476.7648 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637
util living area	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642
	0.9864	0.9748	0.9496	0.8905	0.7787	0.6207	0.4751	0.5268	0.7516	0.9242	0.9769	0.9890 (86)
MIT	19.3800	19.6061	19.9539	20.3705	20.7154	20.9100	20.9741	20.9622	20.8140	20.3541	19.7747	19.3180 (87)
Th 2	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417 (88)
util rest of house	0.9837	0.9698	0.9393	0.8676	0.7335	0.5468	0.3797	0.4291	0.6863	0.9034	0.9713	0.9868 (89)
MIT 2	18.5607	18.7840	19.1250	19.5238	19.8354	19.9912	20.0320	20.0264	19.9248	19.5171	18.9531	18.4992 (90)
Living area fraction	18.7091	18.9329	19.2751	19.6772	19.9948	20.1577	20.2027	20.1959	20.0859	19.6687	19.1019	18.6475 (91)
MIT	18.7091	18.9329	19.2751	19.6772	19.9948	20.1577	20.2027	20.1959	20.0859	19.6687	19.1019	18.6475 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7091	18.9329	19.2751	19.6772	19.9948	20.1577	20.2027	20.1959	20.0859	19.6687	19.1019	18.6475 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9785	0.9622	0.9291	0.8575	0.7311	0.5562	0.3963	0.4455	0.6897	0.8935	0.9642	0.9823 (94)
Useful gains	495.5815	573.7418	633.6568	659.5516	605.2647	453.8009	308.2102	321.3250	452.5560	508.9741	482.5257	468.3342 (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	1260.4821	1227.5763	1117.5440	942.7672	725.6159	486.1745	315.1569	332.0594	523.6329	793.3119	1049.9044	1263.8432 (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	569.0861	439.3767	360.0121	203.9153	89.5413	0.0000	0.0000	0.0000	0.0000	211.5473	408.5127	591.8587 (98)
Space heating												2873.8501 (98)
Space heating per m2										(98) / (4) =		34.5000 (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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3168.5227 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	569.0861	439.3767	360.0121	203.9153	89.5413	0.0000	0.0000	0.0000	0.0000	211.5473	408.5127	591.8587	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	627.4378	484.4286	396.9262	224.8239	98.7225	0.0000	0.0000	0.0000	0.0000	233.2384	450.3999	652.5454	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244	(64)
Efficiency of water heater (217)m	90.0079	89.9382	89.7970	89.5038	88.9557	87.9000	87.9000	87.9000	87.9000	89.5037	89.8814	90.0419	(216)
Fuel for water heating, kWh/month	201.1784	176.9615	184.9517	164.6910	161.1825	144.0072	136.6508	152.2345	152.6876	170.8644	181.9762	195.7137	(217)
Water heating fuel used												2023.0995	(219)
Annual totals kWh/year													
Space heating fuel - main system												3168.5227	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4340)													
mechanical ventilation fans (SFP = 0.4340)												111.5874	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												186.5874	(231)
Electricity for lighting (calculated in Appendix L)												358.4020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1068 * 1.00) =										-623.7532		-623.7532	(233)
Total delivered energy for all uses												5112.8584	(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	3168.5227	0.2160	684.4009	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2023.0995	0.2160	436.9895	(264)
Space and water heating			1121.3904	(265)
Pumps and fans	186.5874	0.5190	96.8389	(267)
Energy for lighting	358.4020	0.5190	186.0106	(268)
Energy saving/generation technologies				
PV Unit	-623.7532	0.5190	-323.7279	(269)
Total CO2, kg/year			1080.5120	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.9700	(273)

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

DER	12.9700	ZC1
Total Floor Area	83.3000	TFA
Assumed number of occupants	2.5225	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.0913	ZC2
CO2 emissions from cooking, equation (L16)	2.1553	ZC3
Total CO2 emissions	31.2167	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	31.2167	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	41.6500 (1b)	x 2.3900 (2b)	= 99.5435 (1b) - (3b)
First floor	41.6500 (1c)	x 2.6700 (2c)	= 111.2055 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.7490 (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) = 0.1423 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3923 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3629 (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	0.4627	0.4537	0.4446	0.3992	0.3901	0.3448	0.3448	0.3357	0.3629	0.3901	0.4083	0.4264 (22b)
Effective ac	0.6071	0.6029	0.5988	0.5797	0.5761	0.5594	0.5594	0.5563	0.5659	0.5761	0.5833	0.5909 (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			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			16.7700	1.3258	22.2330		(27)
Ground Floor			41.6500	0.1300	5.4145		(28a)
Brick and Block	85.9500	18.8900	67.0600	0.1800	12.0708		(29a)
Pitched Roof	41.6500		41.6500	0.1300	5.4145		(30)
Total net area of external elements Aum(A, m ²)			169.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2528		(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)							10.7518 (36)
Total fabric heat loss						(33) + (36) =	58.0046 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	42.2192	41.9301	41.6467	40.3156	40.0665	38.9072	38.9072
Heat transfer coeff	100.2237	99.9346	99.6512	98.3201	98.0711	96.9117	96.9117
Average = Sum(39)m / 12 =							
HLP	1.2032	1.1997	1.1963	1.1803	1.1773	1.1634	1.1634
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5225 (42)
Average daily hot water use (litres/day)												94.1094 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.5203	99.7559	95.9916	92.2272	88.4628	84.6984	84.6984	88.4628	92.2272	95.9916	99.7559	103.5203 (44)
Energy conte	153.5176	134.2675	138.5520	120.7930	115.9038	100.0162	92.6797	106.3513	107.6214	125.4224	136.9084	148.6736 (45)
Energy content (annual)												Total = Sum(45)m = 1480.7069 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.0276	20.1401	20.7828	18.1190	17.3856	15.0024	13.9019	15.9527	16.1432	18.8134	20.5363	22.3010 (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 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	45.9151	48.9162	45.4819	45.0797	41.7691	43.1614	45.0797	45.4819	48.9162	49.1947	50.9589 (61)
Solar input	204.4765	180.1826	187.4683	166.2749	160.9835	141.7852	135.8411	151.4310	153.1033	174.3387	186.1031	199.6325 (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	204.4765	180.1826	187.4683	166.2749	160.9835	141.7852	135.8411	151.4310	153.1033	174.3387	186.1031	199.6325 (64)
	63.7843	56.1227	58.2976	51.5342	49.8079	43.6976	41.6063	46.6317	47.1546	53.9320	57.8207	62.1737 (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	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.2942	18.0251	14.6590	11.0978	8.2958	7.0036	7.5677	9.8367	13.2028	16.7640	19.5661	20.8582	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.1990	228.5463	222.6313	210.0390	194.1436	179.2041	169.2236	166.8763	172.7913	185.3836	201.2790	216.2185	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	(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)	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	(71)
Water heating gains (Table 5)	85.7316	83.5159	78.3570	71.5752	66.9461	60.6912	55.9225	62.6770	65.4925	72.4893	80.3065	83.5668	(72)
Total internal gains	396.0624	393.9248	379.4848	356.5496	333.2230	310.7364	296.5512	303.2276	315.3242	338.4744	364.9892	384.4811	(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				6.9400	10.6334	0.6300	0.7000	0.7700	22.5529 (74)				
East				5.4000	19.6403	0.6300	0.7000	0.7700	32.4125 (76)				
South				4.4300	46.7521	0.6300	0.7000	0.7700	63.2960 (78)				
Solar gains	118.2615	210.1682	309.7051	419.1709	500.6267	510.3695	486.5135	423.9164	347.4393	238.3508	143.2639	100.1493	(83)
Total gains	514.3239	604.0930	689.1900	775.7205	833.8496	821.1058	783.0648	727.1440	662.7635	576.8252	508.2531	484.6304	(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	57.7181	57.8851	58.0497	58.8356	58.9850	59.6906	59.6906	59.8232	59.4168	58.9850	58.6835	58.3716	
alpha	4.8479	4.8590	4.8700	4.9224	4.9323	4.9794	4.9794	4.9882	4.9611	4.9323	4.9122	4.8914	
util living area	0.9977	0.9946	0.9856	0.9539	0.8664	0.6992	0.5322	0.5901	0.8378	0.9730	0.9952	0.9983	(86)
MIT	19.7041	19.8736	20.1440	20.4958	20.7873	20.9481	20.9891	20.9823	20.8691	20.4854	20.0313	19.6779	(87)
Th 2	19.9175	19.9202	19.9230	19.9358	19.9382	19.9494	19.9494	19.9515	19.9451	19.9382	19.9333	19.9283	(88)
util rest of house	0.9969	0.9928	0.9804	0.9367	0.8180	0.6062	0.4115	0.4663	0.7632	0.9595	0.9932	0.9977	(89)
MIT 2	18.1962	18.4453	18.8391	19.3471	19.7315	19.9153	19.9455	19.9443	19.8409	19.3428	18.6855	18.1656	(90)
Living area fraction	18.4693	18.7040	19.0755	19.5552	19.9227	20.1024	20.1345	20.1323	20.0272	19.5498	18.9293	18.4395	(91)
MIT	18.4693	18.7040	19.0755	19.5552	19.9227	20.1024	20.1345	20.1323	20.0272	19.5498	18.9293	18.4395	(92)
Temperature adjustment	18.4693	18.7040	19.0755	19.5552	19.9227	20.1024	20.1345	20.1323	20.0272	19.5498	18.9293	18.4395	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9953	0.9897	0.9748	0.9289	0.8172	0.6207	0.4334	0.4886	0.7699	0.9529	0.9904	0.9965	(94)
Ext temp.	511.9318	597.9009	671.8039	720.5392	681.4426	509.6756	339.3751	355.3014	510.2566	549.6321	503.3655	482.9202	(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	1420.1021	1379.4992	1253.1590	1047.6221	806.4120	533.2483	342.5370	360.9066	577.0616	877.7182	1166.0718	1411.1609	(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	675.6787	525.2341	432.5282	235.4997	92.9772	0.0000	0.0000	0.0000	0.0000	244.0961	477.1486	690.6111	(98)
Space heating per m2												3373.7736	(98)
												40.5015	(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													3612.1773 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	675.6787	525.2341	432.5282	235.4997	92.9772	0.0000	0.0000	0.0000	0.0000	244.0961	477.1486	690.6111	(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)	723.4248	562.3491	463.0923	252.1410	99.5473	0.0000	0.0000	0.0000	0.0000	261.3448	510.8657	739.4123	(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	204.4765	180.1826	187.4683	166.2749	160.9835	141.7852	135.8411	151.4310	153.1033	174.3387	186.1031	199.6325	(64)
Efficiency of water heater (217)m	87.8334	87.5861	87.0879	85.9272	83.7247	80.3000	80.3000	80.3000	80.3000	85.8985	87.3183	80.3000	(216)
Fuel for water heating, kWh/month	232.8003	205.7205	215.2633	193.5068	192.2773	176.5694	169.1670	188.5815	190.6642	202.9589	213.1318	227.0611	(219)
Water heating fuel used												2407.7019	(219)
Annual totals kWh/year													
Space heating fuel - main system												3612.1773	(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)												358.4020	(232)
Total delivered energy for all uses												6453.2812	(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	3612.1773	0.2160	780.2303 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2407.7019	0.2160	520.0636 (264)
Space and water heating			1300.2939 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	358.4020	0.5190	186.0106 (268)
Total CO2, kg/m2/year			1525.2295 (272)
Emissions per m2 for space and water heating			15.6098 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2330 (272b)
Emissions per m2 for pumps and fans			0.4673 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.6098 * 1.00) + 2.2330 + 0.4673, rounded to 2 d.p.			18.3100 (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	41.6500 (1b)	x 2.3900 (2b)	= 99.5435 (1b) - (3b)
First floor	41.6500 (1c)	x 2.6700 (2c)	= 111.2055 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.7490 (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) = 0.1423 (8)
Pressure test					Yes
Measured/design AP50					3.9500
Infiltration rate					0.3398 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3144 (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	0.4008	0.3930	0.3851	0.3458	0.3379	0.2986	0.2986	0.2908	0.3144	0.3379	0.3537	0.3694 (22b)
Effective ac	0.5803	0.5772	0.5741	0.5598	0.5571	0.5446	0.5446	0.5423	0.5494	0.5571	0.5625	0.5682 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.6500	0.1200	4.9980	84.0000	3498.6000 (28a)
Brick and Block	85.9500	18.8900	67.0600	0.2400	16.0944	42.2200	2831.2732 (29a)
Pitched Roof	41.6500		41.6500	0.1000	4.1650	9.1000	379.0150 (30)
Total net area of external elements Aum(A, m ²)			169.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.7917		(33)
GF Stud			27.5200			9.0000	247.6800 (32c)
First Floor			98.6600			9.0000	887.9400 (32c)
GF Block			43.2200			75.0000	3241.5000 (32c)
Internal Floor 1			41.6500			18.0000	749.7000 (32d)
Internal Ceiling 1			41.6500			9.0000	374.8500 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12210.5582 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 146.5853 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9129 (36)
Total fabric heat loss (33) + (36) = 52.7046 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.3599	40.1430	39.9304	38.9317	38.7448	37.8750	37.8750	37.7139	38.2100	38.7448	39.1228	39.5180 (38)
Heat transfer coeff	93.0645	92.8475	92.6349	91.6362	91.4494	90.5795	90.5795	90.4184	90.9146	91.4494	91.8274	92.2226 (39)
Average = Sum(39)m / 12 =												91.6353 (39)
HLP	1.1172	1.1146	1.1121	1.1001	1.0978	1.0874	1.0874	1.0855	1.0914	1.0978	1.1024	1.1071 (40)
HLP (average)												1.1001 (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												2.5225 (42)
Average daily hot water use (litres/day)												94.1094 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.5203	99.7559	95.9916	92.2272	88.4628	84.6984	84.6984	88.4628	92.2272	95.9916	99.7559	103.5203 (44)
Energy conte	153.5176	134.2675	138.5520	120.7930	115.9038	100.0162	92.6797	106.3513	107.6214	125.4224	136.9084	148.6736 (45)
Energy content (annual)										Total = Sum(45)m =		1480.7069 (45)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.6225	28.5318	29.4423	25.6685	24.6296	21.2534	19.6944	22.5996	22.8696	26.6523	29.0930	31.5931 (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	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.2942	18.0251	14.6590	11.0978	8.2958	7.0036	7.5677	9.8367	13.2028	16.7640	19.5661	20.8582	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.1990	228.5463	222.6313	210.0390	194.1436	179.2041	169.2236	166.8763	172.7913	185.3836	201.2790	216.2185	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	(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)	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	(71)
Water heating gains (Table 5)	43.8474	42.4581	39.5730	35.6507	33.1042	29.5187	26.4710	30.3759	31.7633	35.8229	40.4070	42.4639	(72)
Total internal gains	351.1782	349.8670	337.7008	317.6251	296.3811	276.5639	264.0998	267.9265	278.5949	298.8081	322.0896	340.3782	(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	6.9400	10.6334	0.6300	0.7000	0.7700	22.5529 (74)
East	5.4000	19.6403	0.6300	0.7000	0.7700	32.4125 (76)
South	4.4300	46.7521	0.6300	0.7000	0.7700	63.2960 (78)

Solar gains	118.2615	210.1682	309.7051	419.1709	500.6267	510.3695	486.5135	423.9164	347.4393	238.3508	143.2639	100.1493 (83)
Total gains	469.4397	560.0352	647.4059	736.7960	797.0077	786.9333	750.6133	691.8428	626.0342	537.1589	465.3536	440.5275 (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	36.4459	36.5311	36.6149	37.0140	37.0896	37.4458	37.4458	37.5125	37.3078	37.0896	36.9369	36.7787	
alpha	3.4297	3.4354	3.4410	3.4676	3.4726	3.4964	3.4964	3.5008	3.4872	3.4726	3.4625	3.4519	
util living area	0.9884	0.9783	0.9562	0.9031	0.8009	0.6475	0.5021	0.5563	0.7779	0.9351	0.9805	0.9906 (86)	
MIT	19.1573	19.3982	19.7743	20.2470	20.6395	20.8804	20.9630	20.9470	20.7612	20.2374	19.6081	19.1136 (87)	
Th 2	19.9868	19.9889	19.9910	20.0008	20.0026	20.0111	20.0111	20.0127	20.0079	20.0026	19.9989	19.9950 (88)	
util rest of house	0.9861	0.9738	0.9470	0.8820	0.7572	0.5719	0.4006	0.4535	0.7143	0.9166	0.9757	0.9887 (89)	
MIT 2	18.3016	18.5417	18.9134	19.3768	19.7379	19.9428	19.9970	19.9907	19.8547	19.3781	18.7593	18.2643 (90)	
Living area fraction	18.4566	18.6969	19.0693	19.5345	19.9013	20.1127	20.1720	20.1640	20.0189	19.5338	18.9130	18.4182 (91)	
MIT	18.4566	18.6969	19.0693	19.5345	19.9013	20.1127	20.1720	20.1640	20.0189	19.5338	18.9130	18.4182 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.4566	18.6969	19.0693	19.5345	19.9013	20.1127	20.1720	20.1640	20.0189	19.5338	18.9130	18.4182 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9811	0.9663	0.9364	0.8703	0.7523	0.5802	0.4178	0.4702	0.7151	0.9057	0.9688	0.9845 (94)
Useful gains	460.5745	541.1844	606.2264	641.2392	599.5521	456.6088	313.6133	325.2857	447.6665	486.5033	450.8373	433.6984 (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	1317.4784	1281.0045	1164.3599	974.5021	749.9998	499.3356	323.5480	340.3314	538.1181	816.9867	1084.7599	1311.2347 (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	637.5365	497.1591	415.2513	239.9493	111.9331	0.0000	0.0000	0.0000	0.0000	245.8797	456.4243	652.8870 (98)
Space heating												3257.0202 (98)
Space heating per m2												39.0999 (99)
										(98) / (4) =		

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	851.4474	670.2884	687.1801	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8401	0.8952	0.8700	0.0000	0.0000	0.0000	0.0000 (101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	715.3152	600.0328	597.8754	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1014.1397	969.7224	902.6311	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	215.1536	275.0491	226.7382	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												716.9409 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	53.7884	68.7623	56.6846	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												179.2352 (107)
Space cooling per m2												2.1517 (108)
Energy for space heating												39.0999 (99)
Energy for space cooling												2.1517 (108)
Total												41.2516 (109)
Dwelling Fabric Energy Efficiency (DFEE)												41.3 (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	41.6500 (1b)	x 2.3900 (2b)	= 99.5435 (1b) - (3b)
First floor	41.6500 (1c)	x 2.6700 (2c)	= 111.2055 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.7490 (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) = 0.1423 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3923 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3629 (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	0.4627	0.4537	0.4446	0.3992	0.3901	0.3448	0.3448	0.3357	0.3629	0.3901	0.4083	0.4264 (22b)
Effective ac	0.6071	0.6029	0.5988	0.5797	0.5761	0.5594	0.5594	0.5563	0.5659	0.5761	0.5833	0.5909 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			16.7700	1.3258	22.2330		(27)					
Ground Floor			41.6500	0.1300	5.4145		(28a)					
Brick and Block	85.9500	18.8900	67.0600	0.1800	12.0708		(29a)					
Pitched Roof	41.6500		41.6500	0.1300	5.4145		(30)					
Total net area of external elements Aum(A, m2)			169.2500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		47.2528		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7518 (36)					
Total fabric heat loss						(33) + (36) =	58.0046 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.2192	41.9301	41.6467	40.3156	40.0665	38.9072	38.9072	38.6925	39.3537	40.0665	40.5703	41.0970 (38)
Heat transfer coeff	100.2237	99.9346	99.6512	98.3201	98.0711	96.9117	96.9117	96.6970	97.3583	98.0711	98.5749	99.1016 (39)
Average = Sum(39)m / 12 =												98.3189 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2032	1.1997	1.1963	1.1803	1.1773	1.1634	1.1634	1.1608	1.1688	1.1773	1.1834	1.1897 (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												2.5225 (42)
Average daily hot water use (litres/day)												94.1094 (43)
Daily hot water use	Jan 103.5203	Feb 99.7559	Mar 95.9916	Apr 92.2272	May 88.4628	Jun 84.6984	Jul 84.6984	Aug 88.4628	Sep 92.2272	Oct 95.9916	Nov 99.7559	Dec 103.5203 (44)
Energy conte	153.5176	134.2675	138.5520	120.7930	115.9038	100.0162	92.6797	106.3513	107.6214	125.4224	136.9084	148.6736 (45)
Energy content (annual)										Total = Sum(45)m =		1480.7069 (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	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.6225	28.5318	29.4423	25.6685	24.6296	21.2534	19.6944	22.5996	22.8696	26.6523	29.0930	31.5931	(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	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	126.1250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.2942	18.0251	14.6590	11.0978	8.2958	7.0036	7.5677	9.8367	13.2028	16.7640	19.5661	20.8582	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.1990	228.5463	222.6313	210.0390	194.1436	179.2041	169.2236	166.8763	172.7913	185.3836	201.2790	216.2185	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	35.6125	(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)	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	(71)
Water heating gains (Table 5)	43.8474	42.4581	39.5730	35.6507	33.1042	29.5187	26.4710	30.3759	31.7633	35.8229	40.4070	42.4639	(72)
Total internal gains	351.1782	349.8670	337.7008	317.6251	296.3811	276.5639	264.0998	267.9265	278.5949	298.8081	322.0896	340.3782	(73)

6. Solar gains													

[Jan]			Area	Solar flux		g		FF		Access		Gains	
			m2	Table 6a		Specific data		Specific data		factor		W	
				W/m2		or Table 6b		or Table 6c		Table 6d			
North			6.9400	10.6334		0.6300		0.7000		0.7700		22.5529	(74)
East			5.4000	19.6403		0.6300		0.7000		0.7700		32.4125	(76)
South			4.4300	46.7521		0.6300		0.7000		0.7700		63.2960	(78)

Solar gains	118.2615	210.1682	309.7051	419.1709	500.6267	510.3695	486.5135	423.9164	347.4393	238.3508	143.2639	100.1493	(83)
Total gains	469.4397	560.0352	647.4059	736.7960	797.0077	786.9333	750.6133	691.8428	626.0342	537.1589	465.3536	440.5275	(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	57.7181	57.8851	58.0497	58.8356	58.9850	59.6906	59.6906	59.8232	59.4168	58.9850	58.6835	58.3716	
alpha	4.8479	4.8590	4.8700	4.9224	4.9323	4.9794	4.9794	4.9882	4.9611	4.9323	4.9122	4.8914	
util living area	0.9985	0.9961	0.9888	0.9618	0.8822	0.7209	0.5529	0.6156	0.8602	0.9795	0.9967	0.9989	(86)
MIT	19.6545	19.8256	20.1003	20.4606	20.7656	20.9405	20.9872	20.9788	20.8502	20.4460	19.9843	19.6289	(87)
Th 2	19.9175	19.9202	19.9230	19.9358	19.9382	19.9494	19.9494	19.9515	19.9451	19.9382	19.9333	19.9283	(88)
util rest of house	0.9980	0.9948	0.9847	0.9469	0.8370	0.6281	0.4286	0.4887	0.7902	0.9689	0.9953	0.9985	(89)
MIT 2	18.6928	18.8656	19.1402	19.5014	19.7802	19.9222	19.9462	19.9455	19.8615	19.4947	19.0347	18.6759	(90)
Living area fraction									fLA = Living area / (4) =			0.1812	(91)
MIT	18.8670	19.0395	19.3142	19.6752	19.9587	20.1067	20.1348	20.1326	20.0406	19.6670	19.2068	18.8485	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8670	19.0395	19.3142	19.6752	19.9587	20.1067	20.1348	20.1326	20.0406	19.6670	19.2068	18.8485	(93)

8. Space heating requirement													

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9972	0.9932	0.9816	0.9423	0.8381	0.6432	0.4513	0.5118	0.7977	0.9653	0.9940	0.9980	(94)
Useful gains	468.1370	556.2513	635.5062	694.2991	667.9350	506.1310	338.7776	354.0731	499.3645	518.5204	462.5632	439.6280	(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	1459.9591	1413.0227	1276.9460	1059.4178	809.9421	533.6646	342.5592	360.9357	578.3688	889.2119	1193.4217	1451.6944	(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	737.9156	575.7504	477.2312	262.8854	105.6533	0.0000	0.0000	0.0000	0.0000	275.7944	526.2181	752.9774	(98)
Space heating												3714.4259	(98)
Space heating per m2										(98) / (4) =		44.5909	(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	910.9702	717.1467	734.8974	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8741	0.9306	0.9059	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	796.2522	667.3764	665.7262	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1014.1397	969.7224	902.6311	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	156.8790	224.9454	176.2572	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												558.0816	(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	39.2198	56.2363	44.0643	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												139.5204 (107)
Space cooling per m2												1.6749 (108)
Energy for space heating												44.5909 (99)
Energy for space cooling												1.6749 (108)
Total												46.2659 (109)
Target Fabric Energy Efficiency (TFEE)												53.2 (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	41.6500 (1b)	x 2.3900 (2b)	= 99.5435 (1b) - (3b)
First floor	41.6500 (1c)	x 2.6700 (2c)	= 111.2055 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.7490 (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																		3.9500					
Number of sides sheltered																		0.1975 (18)					
																		1 (19)					
Shelter factor												(20) = 1 - [0.075 x (19)] =						0.9250 (20)					
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =						0.1827 (21)					
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec											
	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																							
	0.2147	0.2010	0.2010	0.1827	0.1873	0.1781	0.1781	0.1736	0.1736	0.1873	0.1827	0.1873	(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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.6500	0.1200	4.9980	84.0000	3498.6000 (28a)
Brick and Block	85.9500	18.8900	67.0600	0.2400	16.0944	42.2200	2831.2732 (29a)
Pitched Roof	41.6500		41.6500	0.1000	4.1650	9.1000	379.0150 (30)
Total net area of external elements Aum(A, m ²)			169.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.7917		(33)
GF Stud			27.5200			9.0000	247.6800 (32c)
First Floor			98.6600			9.0000	887.9400 (32c)
GF Block			43.2200			75.0000	3241.5000 (32c)
Internal Floor 1			41.6500			18.0000	749.7000 (32d)
Internal Ceiling 1			41.6500			18.0000	749.7000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12585.4082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							151.0853 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9129 (36)
Total fabric heat loss						(33) + (36) =	52.7046 (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	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736 (38)
Heat transfer coeff	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781 (39)
Average = Sum(39)m / 12 =												87.4781 (39)
HLP	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502 (40)
HLP (average)												1.0502 (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	2.5225 (42)
Average daily hot water use (litres/day)	94.1094 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	103.5203	99.7559	95.9916	92.2272	88.4628	84.6984	84.6984	88.4628	92.2272	95.9916	99.7559	103.5203 (44)
Energy content (annual)	153.5176	134.2675	138.5520	120.7930	115.9038	100.0162	92.6797	106.3513	107.6214	125.4224	136.9084	148.6736 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1480.7069 (45)
	23.0276	20.1401	20.7828	18.1190	17.3856	15.0024	13.9019	15.9527	16.1432	18.8134	20.5363	22.3010 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5588	24.8884	27.5290	26.6116	27.4772	26.5662	27.4364	27.4629	26.5909	27.5076	26.6544	27.5507 (61)
Total heat required for water heating calculated for each month	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	57.9343	50.8660	52.9508	46.8166	45.4073	39.8969	37.6751	42.2275	42.4319	48.5799	52.1856	56.3217 (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	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.7355	45.0628	36.6476	27.7446	20.7394	17.5091	18.9192	24.5918	33.0071	41.9101	48.9153	52.1456 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	337.6105	341.1138	332.2855	313.4911	289.7665	267.4688	252.5725	249.0692	257.8975	276.6919	300.4165	322.7142 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575 (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)	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000 (71)
Water heating gains (Table 5)	77.8687	75.6935	71.1704	65.0230	61.0313	55.4124	50.6386	56.7574	58.9331	65.2955	72.4800	75.7012 (72)
Total internal gains	572.3222	567.9777	546.2110	512.3662	477.6448	446.4977	428.2377	436.5259	455.9452	490.0050	527.9193	556.6685 (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				6.9400	13.4684		0.6300	0.7000	0.7700		28.5659 (74)	
East				5.4000	25.1733		0.6300	0.7000	0.7700		41.5437 (76)	
South				4.4300	56.5862		0.6300	0.7000	0.7700		76.6101 (78)	

Solar gains	146.7197	222.5649	335.5921	458.4913	516.8990	583.6192	534.3369	484.7420	395.0179	272.8478	177.2919	117.5392 (83)
Total gains	719.0419	790.5426	881.8032	970.8575	994.5438	1030.1170	962.5746	921.2679	850.9631	762.8528	705.2112	674.2077 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637
alpha	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642
util living area	0.9506	0.9315	0.8812	0.7785	0.6265	0.4214	0.2973	0.3012	0.5407	0.7935	0.9166	0.9581 (86)
MIT	19.8817	20.0297	20.3341	20.6668	20.8854	20.9797	20.9959	20.9958	20.9499	20.7081	20.2613	19.8330 (87)
Th 2	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417 (88)
util rest of house	0.9411	0.9187	0.8596	0.7404	0.5672	0.3467	0.2122	0.2123	0.4600	0.7474	0.8982	0.9497 (89)
MIT 2	19.0532	19.1956	19.4850	19.7876	19.9691	20.0331	20.0408	20.0408	20.0172	19.8319	19.4225	19.0065 (90)
Living area fraction									fLA = Living area / (4) =			0.1812 (91)
MIT	19.2032	19.3467	19.6389	19.9468	20.1351	20.2046	20.2138	20.2138	20.1861	19.9906	19.5745	19.1563 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2032	19.3467	19.6389	19.9468	20.1351	20.2046	20.2138	20.2138	20.1861	19.9906	19.5745	19.1563 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9309	0.9077	0.8493	0.7363	0.5733	0.3597	0.2277	0.2284	0.4727	0.7447	0.8876	0.9401 (94)
Ext temp.	669.3793	717.5409	748.8990	714.8764	570.1844	370.5195	219.1445	210.4209	402.2681	568.1009	625.9631	633.8291 (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	1189.9870	1167.5469	1053.1369	861.3836	615.4170	376.5553	219.9040	211.1582	418.6833	690.2550	960.0257	1177.1288 (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)
RHI space heating demand	387.3321	302.4041	226.3530	105.4852	33.6531	0.0000	0.0000	0.0000	0.0000	90.8827	240.5251	404.2149 (98)
												1790.8501 (98)
												1791 (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	41.6500 (1b)	x 2.3900 (2b)	= 99.5435 (1b) - (3b)
First floor	41.6500 (1c)	x 2.6700 (2c)	= 111.2055 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.7490 (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					3.9500
Infiltration rate					0.1975 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1827 (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	0.2329	0.2284	0.2238	0.2010	0.1964	0.1736	0.1736	0.1690	0.1827	0.1964	0.2055	0.2147 (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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.6500	0.1200	4.9980	84.0000	3498.6000 (28a)
Brick and Block	85.9500	18.8900	67.0600	0.2400	16.0944	42.2200	2831.2732 (29a)
Pitched Roof	41.6500		41.6500	0.1000	4.1650	9.1000	379.0150 (30)
Total net area of external elements Aum(A, m ²)			169.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.7917		(33)
GF Stud			27.5200			9.0000	247.6800 (32c)
First Floor			98.6600			9.0000	887.9400 (32c)
GF Block			43.2200			75.0000	3241.5000 (32c)
Internal Floor 1			41.6500			18.0000	749.7000 (32d)
Internal Ceiling 1			41.6500			18.0000	749.7000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12585.4082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							151.0853 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9129 (36)
Total fabric heat loss						(33) + (36) =	52.7046 (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	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736 (38)
Average = Sum(39)m / 12 =	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502 (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												2.5225 (42)
Average daily hot water use (litres/day)												94.1094 (43)
Daily hot water use	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

Energy conte	103.5203	99.7559	95.9916	92.2272	88.4628	84.6984	84.6984	88.4628	92.2272	95.9916	99.7559	103.5203 (44)
Energy content (annual)	153.5176	134.2675	138.5520	120.7930	115.9038	100.0162	92.6797	106.3513	107.6214	125.4224	136.9084	148.6736 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0276	20.1401	20.7828	18.1190	17.3856	15.0024	13.9019	15.9527	16.1432	18.8134	20.5363	22.3010 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5588	24.8884	27.5290	26.6116	27.4772	26.5662	27.4364	27.4629	26.5909	27.5076	26.6544	27.5507 (61)
Total heat required for water heating calculated for each month	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244 (64)
Heat gains from water heating, kWh/month	57.9343	50.8660	52.9508	46.8166	45.4073	39.8969	37.6751	42.2275	42.4319	48.5799	52.1856	56.3217 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	50.7355	45.0628	36.6476	20.7394	17.5091	18.9192	24.5918	33.0071	41.9101	48.9153	52.1456	52.1456 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	337.6105	341.1138	332.2855	313.4911	289.7665	267.4688	252.5725	249.0692	257.8975	276.6919	300.4165	322.7142 (68)
Pumps, fans	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000 (71)
Total internal gains	77.8687	75.6935	71.1704	65.0230	61.0313	55.4124	50.6386	56.7574	58.9331	65.2955	72.4800	75.7012 (72)
	572.3222	567.9777	546.2110	512.3662	477.6448	446.4977	428.2377	436.5259	455.9452	490.0050	527.9193	556.6685 (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				6.9400	10.6334	0.6300	0.7000	0.7700	22.5529 (74)			
East				5.4000	19.6403	0.6300	0.7000	0.7700	32.4125 (76)			
South				4.4300	46.7521	0.6300	0.7000	0.7700	63.2960 (78)			
Solar gains	118.2615	210.1682	309.7051	419.1709	500.6267	510.3695	486.5135	423.9164	347.4393	238.3508	143.2639	100.1493 (83)
Total gains	690.5837	778.1459	855.9162	931.5371	978.2714	956.8672	914.7513	860.4423	803.3845	728.3558	671.1832	656.8178 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637
util living area	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642
	0.9651	0.9457	0.9084	0.8327	0.7081	0.5480	0.4104	0.4518	0.6623	0.8633	0.9458	0.9704 (86)
MIT	19.6613	19.8667	20.1728	20.5235	20.7964	20.9402	20.9840	20.9771	20.8795	20.5265	20.0207	19.5975 (87)
Th 2	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417 (88)
util rest of house	0.9586	0.9359	0.8919	0.8030	0.6590	0.4774	0.3254	0.3641	0.5937	0.8320	0.9343	0.9648 (89)
MIT 2	18.8367	19.0369	19.3320	19.6598	19.8985	20.0093	20.0359	20.0328	19.9696	19.6711	19.1907	18.7743 (90)
Living area fraction	18.9861	19.1872	19.4843	19.8163	20.0612	20.1779	20.2077	20.2038	20.1344	19.8261	19.3410	18.9234 (92)
MIT	18.9861	19.1872	19.4843	19.8163	20.0612	20.1779	20.2077	20.2038	20.1344	19.8261	19.3410	18.9234 (93)
Temperature adjustment												0.0000
adjusted MIT	18.9861	19.1872	19.4843	19.8163	20.0612	20.1779	20.2077	20.2038	20.1344	19.8261	19.3410	18.9234 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9497	0.9253	0.8808	0.7952	0.6601	0.4878	0.3404	0.3793	0.6008	0.8240	0.9240	0.9566 (94)
Ext temp.	655.8183	720.0339	753.8499	740.7944	645.7676	466.7571	311.3751	326.3983	482.6474	600.1368	620.1843	628.2935 (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	1284.7114	1249.8159	1135.8397	954.9365	731.4191	487.9453	315.5909	332.7532	527.8790	807.0784	1070.8243	1287.9784 (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	467.8964	356.0135	284.2004	154.1823	63.7247	0.0000	0.0000	0.0000	0.0000	153.9646	324.4608	490.8056 (98)
Space heating per m2												2295.2484 (98)
												(98) / (4) = 27.5540 (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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2530.5936 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	467.8964	356.0135	284.2004	154.1823	63.7247	0.0000	0.0000	0.0000	0.0000	153.9646	324.4608	490.8056	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	515.8726	392.5177	313.3412	169.9915	70.2588	0.0000	0.0000	0.0000	0.0000	169.7515	357.7297	541.1307	(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													
Efficiency of water heater (217)m	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244	(64)
Fuel for water heating, kWh/month	89.9010	89.8161	89.6467	89.3095	88.7429	87.9000	87.9000	87.9000	87.9000	89.2828	89.7419	87.9000	(216)
Water heating fuel used	201.4177	177.2020	185.2617	165.0492	161.5689	144.0072	136.6508	152.2345	152.6876	171.2873	182.2591	195.9288	(219)
Annual totals kWh/year												2025.5548	(219)
Space heating fuel - main system												2530.5936	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4340)													
mechanical ventilation fans (SFP = 0.4340)												111.5874	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												186.5874	(231)
Electricity for lighting (calculated in Appendix L)												358.4020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 + 0.73 * 1068 * 1.00) =										-623.7532		-623.7532	(233)
Total delivered energy for all uses												4477.3846	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2530.5936	3.4800	88.0647 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2025.5548	3.4800	70.4893 (247)
Mechanical ventilation fans	111.5874	13.1900	14.7184 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	358.4020	13.1900	47.2732 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-623.7532	13.1900	-82.2730 (252)
Total energy cost			268.1650 (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] =	0.8779 (257)
SAP value	87.7539	
SAP rating (Section 12)	88	(258)
SAP band	B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2530.5936	0.2160	546.6082 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2025.5548	0.2160	437.5198 (264)
Space and water heating			984.1280 (265)
Pumps and fans	186.5874	0.5190	96.8389 (267)
Energy for lighting	358.4020	0.5190	186.0106 (268)
Energy saving/generation technologies			
PV Unit	-623.7532	0.5190	-323.7279 (269)
Total kg/year			943.2496 (272)
CO2 emissions per m2			11.3200 (273)
EI value			90.1484
EI rating			90 (274)
EI band			B

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8900 = 3.910$, stars = 4
Water heating environmental impact	$0.216 / 0.8900 = 0.2427$, 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	41.6500 (1b)	x 2.3900 (2b)	= 99.5435 (1b) - (3b)
First floor	41.6500 (1c)	x 2.6700 (2c)	= 111.2055 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.7490 (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											3.9500	
Infiltration rate											0.1975 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1827 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	0.2147	0.2010	0.2010	0.1827	0.1873	0.1781	0.1781	0.1736	0.1736	0.1873	0.1827	0.1873 (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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.6500	0.1200	4.9980	84.0000	3498.6000 (28a)
Brick and Block	85.9500	18.8900	67.0600	0.2400	16.0944	42.2200	2831.2732 (29a)
Pitched Roof	41.6500		41.6500	0.1000	4.1650	9.1000	379.0150 (30)
Total net area of external elements Aum(A, m ²)			169.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.7917		(33)
GF Stud			27.5200			9.0000	247.6800 (32c)
First Floor			98.6600			9.0000	887.9400 (32c)
GF Block			43.2200			75.0000	3241.5000 (32c)
Internal Floor 1			41.6500			18.0000	749.7000 (32d)
Internal Ceiling 1			41.6500			18.0000	749.7000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12585.4082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							151.0853 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9129 (36)
Total fabric heat loss						(33) + (36) =	52.7046 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7736	Feb 34.7736	Mar 34.7736	Apr 34.7736	May 34.7736	Jun 34.7736	Jul 34.7736	Aug 34.7736	Sep 34.7736	Oct 34.7736	Nov 34.7736	Dec 34.7736 (38)
Heat transfer coeff	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781 (39)
Average = Sum(39)m / 12 =												87.4781 (39)
HLP	Jan 1.0502	Feb 1.0502	Mar 1.0502	Apr 1.0502	May 1.0502	Jun 1.0502	Jul 1.0502	Aug 1.0502	Sep 1.0502	Oct 1.0502	Nov 1.0502	Dec 1.0502 (40)
HLP (average)												1.0502 (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												2.5225 (42)
Average daily hot water use (litres/day)												94.1094 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	103.5203	99.7559	95.9916	92.2272	88.4628	84.6984	84.6984	88.4628	92.2272	95.9916	99.7559	103.5203 (44)
Energy content (annual)	153.5176	134.2675	138.5520	120.7930	115.9038	100.0162	92.6797	106.3513	107.6214	125.4224	136.9084	148.6736 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0276	20.1401	20.7828	18.1190	17.3856	15.0024	13.9019	15.9527	16.1432	18.8134	20.5363	22.3010 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5588	24.8884	27.5290	26.6116	27.4772	26.5662	27.4364	27.4629	26.5909	27.5076	26.6544	27.5507 (61)
Total heat required for water heating calculated for each month	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244 (64)
Heat gains from water heating, kWh/month	57.9343	50.8660	52.9508	46.8166	45.4073	39.8969	37.6751	42.2275	42.4319	48.5799	52.1856	56.3217 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	50.7355	45.0628	36.6476	27.7446	20.7394	17.5091	18.9192	24.5918	33.0071	41.9101	48.9153	52.1456 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	337.6105	341.1138	332.2855	313.4911	289.7665	267.4688	252.5725	249.0692	257.8975	276.6919	300.4165	322.7142 (68)
Pumps, fans	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000 (71)
Total internal gains	77.8687	75.6935	71.1704	65.0230	61.0313	55.4124	50.6386	56.7574	58.9331	65.2955	72.4800	75.7012 (72)
	572.3222	567.9777	546.2110	512.3662	477.6448	446.4977	428.2377	436.5259	455.9452	490.0050	527.9193	556.6685 (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			6.9400	13.4684	0.6300	0.7000	0.7700	28.5659 (74)				
East			5.4000	25.1733	0.6300	0.7000	0.7700	41.5437 (76)				
South			4.4300	56.5862	0.6300	0.7000	0.7700	76.6101 (78)				
Solar gains	146.7197	222.5649	335.5921	458.4913	516.8990	583.6192	534.3369	484.7420	395.0179	272.8478	177.2919	117.5392 (83)
Total gains	719.0419	790.5426	881.8032	970.8575	994.5438	1030.1170	962.5746	921.2679	850.9631	762.8528	705.2112	674.2077 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637
util living area	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642
	0.9506	0.9315	0.8812	0.7785	0.6265	0.4214	0.2973	0.3012	0.5407	0.7935	0.9166	0.9581 (86)
MIT	19.8817	20.0297	20.3341	20.6668	20.8854	20.9797	20.9959	20.9958	20.9499	20.7081	20.2613	19.8330 (87)
Th 2	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417 (88)
util rest of house	0.9411	0.9187	0.8596	0.7404	0.5672	0.3467	0.2122	0.2123	0.4600	0.7474	0.8982	0.9497 (89)
MIT 2	19.0532	19.1956	19.4850	19.7876	19.9691	20.0331	20.0408	20.0408	20.0172	19.8319	19.4225	19.0065 (90)
Living area fraction	19.2032	19.3467	19.6389	19.9468	20.1351	20.2046	20.2138	20.2138	fLA = Living area / (4) =	19.1861	19.9906	19.5745 (91)
MIT	19.2032	19.3467	19.6389	19.9468	20.1351	20.2046	20.2138	20.2138	20.1861	19.9906	19.5745	19.1563 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2032	19.3467	19.6389	19.9468	20.1351	20.2046	20.2138	20.2138	20.1861	19.9906	19.5745	19.1563 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9309	0.9077	0.8493	0.7363	0.5733	0.3597	0.2277	0.2284	0.4727	0.7447	0.8876	0.9401 (94)
Ext temp.	669.3793	717.5409	748.8990	714.8764	570.1844	370.5195	219.1445	210.4209	402.2681	568.1009	625.9631	633.8291 (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	1189.9870	1167.5469	1053.1369	861.3836	615.4170	376.5553	219.9040	211.1582	418.6833	690.2550	960.0257	1177.1288 (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	387.3321	302.4041	226.3530	105.4852	33.6531	0.0000	0.0000	0.0000	0.0000	90.8827	240.5251	404.2149 (98)
Space heating per m2												1790.8501 (98)
												(98) / (4) = 21.4988 (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 %)												90.7000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1974.4764	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	387.3321	302.4041	226.3530	105.4852	33.6531	0.0000	0.0000	0.0000	0.0000	90.8827	240.5251	404.2149	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	427.0476	333.4113	249.5623	116.3012	37.1037	0.0000	0.0000	0.0000	0.0000	100.2014	265.1875	445.6614	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244	(64)
Efficiency of water heater	89.7888	89.7146	89.4935	89.0466	88.4189	87.9000	87.9000	87.9000	87.9000	88.9233	89.5454	89.8312	(216)
(217)m													(217)
Fuel for water heating, kWh/month	201.6692	177.4025	185.5788	165.5364	162.1611	144.0072	136.6508	152.2345	152.6876	171.9798	182.6590	196.1727	(219)
Water heating fuel used												2028.7397	(219)
Annual totals kWh/year													
Space heating fuel - main system												1974.4764	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4340)													
mechanical ventilation fans (SFP = 0.4340)												111.5874	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												186.5874	(231)
Electricity for lighting (calculated in Appendix L)												358.4020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 1184 * 1.00) =										-691.4075		-691.4075	(233)
Total delivered energy for all uses												3856.7980	(238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1974.4764	3.6300	71.6735 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2028.7397	3.6300	73.6433 (247)
Mechanical ventilation fans	111.5874	19.4400	21.6926 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	358.4020	19.4400	69.6733 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-691.4075	19.4400	-134.4096 (252)
Total energy cost			211.8531 (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	1974.4764	0.2160	426.4869 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2028.7397	0.2160	438.2078 (264)
Space and water heating			864.6947 (265)
Pumps and fans	186.5874	0.5190	96.8389 (267)
Energy for lighting	358.4020	0.5190	186.0106 (268)
Energy saving/generation technologies			
PV Unit	-691.4075	0.5190	-358.8405 (269)
Total kg/year			788.7037 (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	1974.4764	1.2200	2408.8613 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2028.7397	1.2200	2475.0625 (264)
Space and water heating			4883.9237 (265)
Pumps and fans	186.5874	3.0700	572.8233 (267)
Energy for lighting	358.4020	3.0700	1100.2942 (268)

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Energy saving/generation technologies			
PV Unit	-691.4075	3.0700	-2122.6210 (269)
Primary energy kWh/year			4434.4201 (272)
Primary energy kWh/m2/year			53.2343 (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	+ 1.2	-£ 27	-190 kg (24.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£27 2.28 kg/m²	B 89	A 92
Total Savings	£27 2.28 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 490 TEST (31 Jan 2022)
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	£106	£116	-£10
Mains gas	£240	£204	£36
Space heating	£203	£203	£0
Water heating	£74	£47	£27
Lighting	£70	£70	£0
Generated (PV)	-£134	-£134	£0
Total cost of fuels	£212	£186	£26
Total cost of uses	£213	£186	£27
Delivered energy	46 kWh/m²	35 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	53 kWh/m²	40 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.6500 (1b)	x 2.3900 (2b)	= 99.5435 (1b) - (3b)
First floor	41.6500 (1c)	x 2.6700 (2c)	= 111.2055 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	210.7490 (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											3.9500	
Infiltration rate											0.1975 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1827 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.2329	0.2284	0.2238	0.2010	0.1964	0.1736	0.1736	0.1690	0.1827	0.1964	0.2055	0.2147 (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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.6500	0.1200	4.9980	84.0000	3498.6000 (28a)
Brick and Block	85.9500	18.8900	67.0600	0.2400	16.0944	42.2200	2831.2732 (29a)
Pitched Roof	41.6500		41.6500	0.1000	4.1650	9.1000	379.0150 (30)
Total net area of external elements Aum(A, m ²)			169.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.7917		(33)
GF Stud			27.5200			9.0000	247.6800 (32c)
First Floor			98.6600			9.0000	887.9400 (32c)
GF Block			43.2200			75.0000	3241.5000 (32c)
Internal Floor 1			41.6500			18.0000	749.7000 (32d)
Internal Ceiling 1			41.6500			18.0000	749.7000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 12585.4082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							151.0853 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9129 (36)
Total fabric heat loss						(33) + (36) =	52.7046 (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	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736	34.7736 (38)
Heat transfer coeff	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781 (39)
Average = Sum(39)m / 12 =												87.4781 (39)
HLP	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502	1.0502 (40)
HLP (average)												1.0502 (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	2.5225 (42)
Average daily hot water use (litres/day)	94.1094 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	103.5203	99.7559	95.9916	92.2272	88.4628	84.6984	84.6984	88.4628	92.2272	95.9916	99.7559	103.5203 (44)
Energy content (annual)	153.5176	134.2675	138.5520	120.7930	115.9038	100.0162	92.6797	106.3513	107.6214	125.4224	136.9084	148.6736 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1480.7069 (45)
	23.0276	20.1401	20.7828	18.1190	17.3856	15.0024	13.9019	15.9527	16.1432	18.8134	20.5363	22.3010 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5588	24.8884	27.5290	26.6116	27.4772	26.5662	27.4364	27.4629	26.5909	27.5076	26.6544	27.5507 (61)
Total heat required for water heating calculated for each month	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244 (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												1.2248 (H8)
Utilisation factor												0.5580 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.1094 (H14)
Volume ratio Veff/V												0.7969 (H15)
Solar storage volume factor												0.9546 (H16)
Solar input	-24.6322	-41.1040	-70.0048	-93.8202	-115.9069	-113.9550	-112.4490	-98.2473	-76.9473	-52.5460	-29.2173	-849.4428 (H17)
Solar input (sum of months) = Sum (63)m =												-20.6129 (63)
Output from w/h	156.4443	118.0519	96.0763	53.5844	27.4741	12.6274	7.6670	35.5669	57.2651	100.3841	134.3455	155.6115 (64)
Heat gains from water heating, kWh/month	57.9343	50.8660	52.9508	46.8166	45.4073	39.8969	37.6751	42.2275	42.4319	48.5799	52.1856	56.3217 (65)
Total per year (kWh/year) = Sum (64)m =												955.0984 (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	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.7355	45.0628	36.6476	27.7446	20.7394	17.5091	18.9192	24.5918	33.0071	41.9101	48.9153	52.1456 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	337.6105	341.1138	332.2855	313.4911	289.7665	267.4688	252.5725	249.0692	257.8975	276.6919	300.4165	322.7142 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575 (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)	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000 (71)
Water heating gains (Table 5)	77.8687	75.6935	71.1704	65.0230	61.0313	55.4124	50.6386	56.7574	58.9331	65.2955	72.4800	75.7012 (72)
Total internal gains	572.3222	567.9777	546.2110	512.3662	477.6448	446.4977	428.2377	436.5259	455.9452	490.0050	527.9193	556.6685 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.9400	10.6334	0.6300	0.7000	0.7700	22.5529 (74)
East	5.4000	19.6403	0.6300	0.7000	0.7700	32.4125 (76)
South	4.4300	46.7521	0.6300	0.7000	0.7700	63.2960 (78)

Solar gains	118.2615	210.1682	309.7051	419.1709	500.6267	510.3695	486.5135	423.9164	347.4393	238.3508	143.2639	100.1493 (83)
Total gains	690.5837	778.1459	855.9162	931.5371	978.2714	956.8672	914.7513	860.4423	803.3845	728.3558	671.1832	656.8178 (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)												
tau	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637
alpha	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642
util living area	0.9651	0.9457	0.9084	0.8327	0.7081	0.5480	0.4104	0.4518	0.6623	0.8633	0.9458	0.9704 (86)
MIT	19.6613	19.8667	20.1728	20.5235	20.7964	20.9402	20.9840	20.9771	20.8795	20.5265	20.0207	19.5975 (87)
Th 2	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417 (88)
util rest of house	0.9586	0.9359	0.8919	0.8030	0.6590	0.4774	0.3254	0.3641	0.5937	0.8320	0.9343	0.9648 (89)
MIT 2	18.8367	19.0369	19.3320	19.6598	19.8985	20.0093	20.0359	20.0328	19.9696	19.6711	19.1907	18.7743 (90)
Living area fraction									fLA = Living area / (4) =			0.1812 (91)
MIT	18.9861	19.1872	19.4843	19.8163	20.0612	20.1779	20.2077	20.2038	20.1344	19.8261	19.3410	18.9234 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9861	19.1872	19.4843	19.8163	20.0612	20.1779	20.2077	20.2038	20.1344	19.8261	19.3410	18.9234 (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	0.9497	0.9253	0.8808	0.7952	0.6601	0.4878	0.3404	0.3793	0.6008	0.8240	0.9240	0.9566	(94)
Useful gains	655.8183	720.0339	753.8499	740.7944	645.7676	466.7571	311.3751	326.3983	482.6474	600.1368	620.1843	628.2935	(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	1284.7114	1249.8159	1135.8397	954.9365	731.4191	487.9453	315.5909	332.7532	527.8790	807.0784	1070.8243	1287.9784	(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	467.8964	356.0135	284.2004	154.1823	63.7247	0.0000	0.0000	0.0000	0.0000	153.9646	324.4608	490.8056	(98)
Space heating												2295.2484	(98)
Space heating per m2											(98) / (4) =	27.5540	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2530.5936	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	467.8964	356.0135	284.2004	154.1823	63.7247	0.0000	0.0000	0.0000	0.0000	153.9646	324.4608	490.8056	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	515.8726	392.5177	313.3412	169.9915	70.2588	0.0000	0.0000	0.0000	0.0000	169.7515	357.7297	541.1307	(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	156.4443	118.0519	96.0763	53.5844	27.4741	12.6274	7.6670	35.5669	57.2651	100.3841	134.3455	155.6115	(64)	
Efficiency of water heater	89.9818	89.9862	89.9759	89.9609	89.8379	87.9000	87.9000	87.9000	87.9000	89.5739	89.8618	90.0098	(216)	
Fuel for water heating, kWh/month	173.8622	131.1890	106.7801	59.5641	30.5818	14.3656	8.7224	40.4629	65.1480	112.0685	149.5023	172.8829	(219)	
Water heating fuel used												1065.1296	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2530.5936	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4340)														
mechanical ventilation fans (SFP = 0.4340)													111.5874	(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													236.5874	(231)
Electricity for lighting (calculated in Appendix L)													358.4020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1068 * 1.00) =										-623.7532			-623.7532	(233)
Total delivered energy for all uses													3566.9594	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2530.5936	3.4800	88.0647	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1065.1296	3.4800	37.0665	(247)
Mechanical ventilation fans	111.5874	13.1900	14.7184	(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	358.4020	13.1900	47.2732	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-623.7532	13.1900	-82.2730	(252)
Total energy cost			241.3372	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		0.7900	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	88.9790	
SAP rating (Section 12)		89	(258)
SAP band		B	

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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	2530.5936	0.2160	546.6082	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1065.1296	0.2160	230.0680	(264)
Space and water heating			776.6762	(265)
Pumps and fans	236.5874	0.5190	122.7889	(267)
Energy for lighting	358.4020	0.5190	186.0106	(268)
Energy saving/generation technologies				
PV Unit	-623.7532	0.5190	-323.7279	(269)
Total kg/year			761.7478	(272)
CO2 emissions per m2			9.1400	(273)
EI value			92.0441	
EI rating			92	(274)
EI band			A	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.6500 (1b)	x 2.3900 (2b)	= 99.5435 (1b) - (3b)
First floor	41.6500 (1c)	x 2.6700 (2c)	= 111.2055 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	210.7490 (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											3.9500	
Infiltration rate											0.1975 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1827 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	0.2147	0.2010	0.2010	0.1827	0.1873	0.1781	0.1781	0.1736	0.1736	0.1873	0.1827	0.1873 (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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			16.7700	1.1450	19.2023		(27)
Ground Floor			41.6500	0.1200	4.9980	84.0000	3498.6000 (28a)
Brick and Block	85.9500	18.8900	67.0600	0.2400	16.0944	42.2200	2831.2732 (29a)
Pitched Roof	41.6500		41.6500	0.1000	4.1650	9.1000	379.0150 (30)
Total net area of external elements Aum(A, m ²)			169.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.7917		(33)
GF Stud			27.5200			9.0000	247.6800 (32c)
First Floor			98.6600			9.0000	887.9400 (32c)
GF Block			43.2200			75.0000	3241.5000 (32c)
Internal Floor 1			41.6500			18.0000	749.7000 (32d)
Internal Ceiling 1			41.6500			18.0000	749.7000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12585.4082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							151.0853 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9129 (36)
Total fabric heat loss						(33) + (36) =	52.7046 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.7736	Feb 34.7736	Mar 34.7736	Apr 34.7736	May 34.7736	Jun 34.7736	Jul 34.7736	Aug 34.7736	Sep 34.7736	Oct 34.7736	Nov 34.7736	Dec 34.7736 (38)
Heat transfer coeff	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781	87.4781 (39)
Average = Sum(39)m / 12 =												87.4781 (39)
HLP	Jan 1.0502	Feb 1.0502	Mar 1.0502	Apr 1.0502	May 1.0502	Jun 1.0502	Jul 1.0502	Aug 1.0502	Sep 1.0502	Oct 1.0502	Nov 1.0502	Dec 1.0502 (40)
HLP (average)												1.0502 (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												2.5225 (42)
Average daily hot water use (litres/day)												94.1094 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	103.5203	99.7559	95.9916	92.2272	88.4628	84.6984	84.6984	88.4628	92.2272	95.9916	99.7559	103.5203 (44)
Energy content (annual)	153.5176	134.2675	138.5520	120.7930	115.9038	100.0162	92.6797	106.3513	107.6214	125.4224	136.9084	148.6736 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1480.7069 (45)
	23.0276	20.1401	20.7828	18.1190	17.3856	15.0024	13.9019	15.9527	16.1432	18.8134	20.5363	22.3010 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	27.5588	24.8884	27.5290	26.6116	27.4772	26.5662	27.4364	27.4629	26.5909	27.5076	26.6544	27.5507 (61)
Total heat required for water heating calculated for each month	181.0765	159.1559	166.0811	147.4046	143.3810	126.5824	120.1161	133.8142	134.2124	152.9300	163.5628	176.2244 (62)
Aperture area of solar collector												176.2244 (H1)
Zero-loss collector efficiency												3.0000 (H2)
Collector heat loss coefficient												0.7000 (H3)
Collector 2nd order heat loss coefficient												1.8000 (H3a)
Collector effective heat loss coefficient												0.0050 (H3b)
Collector performance ratio												1.8063 (H4)
Annual solar radiation per m2												2.5804 (H5)
Overshading factor												1206.0102 (H6)
Solar energy available												0.8000 (H7)
Adjustment factor for showers												2026.0972 (H7a)
Solar-to-load ratio												1.0000 (H8)
Utilisation factor												1.3683 (H9)
Collector performance factor												0.5185 (H10)
Dedicated solar storage volume												0.8793 (H11)
Effective solar volume												75.0000 (H12)
Daily hot water demand												75.0000 (H13)
Volume ratio Veff/V												94.1094 (H14)
Solar storage volume factor												0.7969 (H15)
Solar input												0.9546 (H16)
Solar input	-28.7732	-40.9187	-71.0045	-95.5131	-110.9927	-120.7278	-114.4684	-104.3841	-81.7012	-56.4689	-34.0322	-881.7679 (H17)
												-22.7831 (H18)
Output from w/h	152.3032	118.2372	95.0765	51.8915	32.3884	5.8545	5.6477	29.4301	52.5112	96.4611	129.5306	153.4413 (64)
Heat gains from water heating, kWh/month	57.9343	50.8660	52.9508	46.8166	45.4073	39.8969	37.6751	42.2275	42.4319	48.5799	52.1856	56.3217 (65)
												922.7733 (66)

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	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500	151.3500 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.7355	45.0628	36.6476	27.7446	20.7394	17.5091	18.9192	24.5918	33.0071	41.9101	48.9153	52.1456 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	337.6105	341.1138	332.2855	313.4911	289.7665	267.4688	252.5725	249.0692	257.8975	276.6919	300.4165	322.7142 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575	52.6575 (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)	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000	-100.9000 (71)
Water heating gains (Table 5)	77.8687	75.6935	71.1704	65.0230	61.0313	55.4124	50.6386	56.7574	58.9331	65.2955	72.4800	75.7012 (72)
Total internal gains	572.3222	567.9777	546.2110	512.3662	477.6448	446.4977	428.2377	436.5259	455.9452	490.0050	527.9193	556.6685 (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				6.9400	13.4684			0.6300		0.7000		0.7700		28.5659 (74)
East				5.4000	25.1733			0.6300		0.7000		0.7700		41.5437 (76)
South				4.4300	56.5862			0.6300		0.7000		0.7700		76.6101 (78)
Solar gains	146.7197	222.5649	335.5921	458.4913	516.8990	583.6192	534.3369	484.7420	395.0179	272.8478	177.2919	117.5392	(83)	
Total gains	719.0419	790.5426	881.8032	970.8575	994.5438	1030.1170	962.5746	921.2679	850.9631	762.8528	705.2112	674.2077	(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)												
tau	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637	39.9637
alpha	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642	3.6642
util living area	0.9506	0.9315	0.8812	0.7785	0.6265	0.4214	0.2973	0.3012	0.5407	0.7935	0.9166	0.9581 (86)
MIT	19.8817	20.0297	20.3341	20.6668	20.8854	20.9797	20.9959	20.9958	20.9499	20.7081	20.2613	19.8330 (87)
Th 2	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417	20.0417 (88)
util rest of house	0.9411	0.9187	0.8596	0.7404	0.5672	0.3467	0.2122	0.2123	0.4600	0.7474	0.8982	0.9497 (89)
MIT 2	19.0532	19.1956	19.4850	19.7876	19.9691	20.0331	20.0408	20.0408	20.0172	19.8319	19.4225	19.0065 (90)
Living area fraction	19.2032	19.3467	19.6389	19.9468	20.1351	20.2046	20.2138	20.2138	20.1861	19.9906	19.5745	19.1563 (91)
Temperature adjustment												0.0000
adjusted MIT	19.2032	19.3467	19.6389	19.9468	20.1351	20.2046	20.2138	20.2138	20.1861	19.9906	19.5745	19.1563 (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	0.9309	0.9077	0.8493	0.7363	0.5733	0.3597	0.2277	0.2284	0.4727	0.7447	0.8876	0.9401	(94)
Useful gains	669.3793	717.5409	748.8990	714.8764	570.1844	370.5195	219.1445	210.4209	402.2681	568.1009	625.9631	633.8291	(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	1189.9870	1167.5469	1053.1369	861.3836	615.4170	376.5553	219.9040	211.1582	418.6833	690.2550	960.0257	1177.1288	(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	387.3321	302.4041	226.3530	105.4852	33.6531	0.0000	0.0000	0.0000	0.0000	90.8827	240.5251	404.2149	(98)
Space heating												1790.8501	(98)
Space heating per m2											(98) / (4) =	21.4988	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													1974.4764	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	387.3321	302.4041	226.3530	105.4852	33.6531	0.0000	0.0000	0.0000	0.0000	90.8827	240.5251	404.2149	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	427.0476	333.4113	249.5623	116.3012	37.1037	0.0000	0.0000	0.0000	0.0000	100.2014	265.1875	445.6614	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	152.3032	118.2372	95.0765	51.8915	32.3884	5.8545	5.6477	29.4301	52.5112	96.4611	129.5306	153.4413	(64)	
Efficiency of water heater	89.8918	89.8951	89.8534	89.7573	89.3049	87.9000	87.9000	87.9000	87.9000	89.2364	89.6998	89.9119	(216)	
(217)m	89.8918	89.8951	89.8534	89.7573	89.3049	87.9000	87.9000	87.9000	87.9000	89.2364	89.6998	89.9119	(217)	
Fuel for water heating, kWh/month	169.4294	131.5280	105.8130	57.8132	36.2672	6.6605	6.4251	33.4813	59.7397	108.0961	144.4045	170.6573	(219)	
Water heating fuel used												1030.3153	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1974.4764	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4340)														
mechanical ventilation fans (SFP = 0.4340)													111.5874	(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													236.5874	(231)
Electricity for lighting (calculated in Appendix L)													358.4020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 1184 * 1.00) =													-691.4075	(233)
Total delivered energy for all uses													2908.3736	(238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1974.4764	3.6300	71.6735	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1030.3153	3.6300	37.4004	(247)
Mechanical ventilation fans	111.5874	19.4400	21.6926	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	358.4020	19.4400	69.6733	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-691.4075	19.4400	-134.4096	(252)
Total energy cost			185.3303	(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	1974.4764	0.2160	426.4869	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1030.3153	0.2160	222.5481	(264)
Space and water heating			649.0350	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Pumps and fans	236.5874	0.5190	122.7889 (267)
Energy for lighting	358.4020	0.5190	186.0106 (268)
Energy saving/generation technologies			
PV Unit	-691.4075	0.5190	-358.8405 (269)
Total kg/year			598.9940 (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	1974.4764	1.2200	2408.8613 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1030.3153	1.2200	1256.9846 (264)
Space and water heating			3665.8459 (265)
Pumps and fans	236.5874	3.0700	726.3233 (267)
Energy for lighting	358.4020	3.0700	1100.2942 (268)
Energy saving/generation technologies			
PV Unit	-691.4075	3.0700	-2122.6210 (269)
Primary energy kWh/year			3369.8423 (272)
Primary energy kWh/m2/year			40.4543 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 71	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	Sh
Project	9 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.97	TER	18.31
Environmental	90 B	% DER<TER	29.16		
CO ₂ Emissions (t/year)	0.79	DFEE	41.25	TFEE	53.21
General Requirements Compliance	Pass	% DFEE<TFEE	22.47		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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	Earthwool Loft Roll 40						
	Main construction	150	0.0400	3.7500	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Earthwool Loft Roll 40						
	Main construction	200	0.0400	5.0000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Earthwool Loft Roll 40						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 11.200 m ² K/W	Lower limit = 10.901 m ² K/W	Average = 11.050 m ² K/W
	Total correction = 0.0065 m ² K/W	U-value (unrounded) = 0.1 W/m ² 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 0647 Plot 71	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	Sh
Project	9 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.97	TER	18.31
Environmental	90 B	% DER<TER	29.16		
CO ₂ Emissions (t/year)	0.79	DFEE	41.25	TFEE	53.21
General Requirements Compliance	Pass	% DFEE<TFEE	22.47		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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 0647 Plot 71	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	Sh
Project	9 Shaw Road, West End, Southampton, SO30 3JZ		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.97	TER	18.31
Environmental	90 B	% DER<TER	29.16		
CO ₂ Emissions (t/year)	0.79	DFEE	41.25	TFEE	53.21
General Requirements Compliance	Pass	% DFEE<TFEE	22.47		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 35.11 m², Perimeter = 16.79 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 0647 Plot 71	Issued on Date	01/03/2022
Assessment Reference	As Built	Prop Type Ref	Sh
Property	9 Shaw Road, West End, Southampton, SO30 3JZ		
SAP Rating	88 B	DER	12.97
Environmental	90 B	TER	18.31
CO ₂ Emissions (t/year)	0.79	% DER<TER	29.16
General Requirements Compliance	Pass	DFEE	41.25
		TFEE	53.21
		% DFEE<TFEE	22.47
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	27.54 m	41.65 m ²
	1st Storey:	7.54 m	41.65 m ²
			2.39 m
			2.67 m

7.0 Living Area	15.09	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	151.09	kJ/m²K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	85.95	67.06

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
		Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill		70.00	

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
GF Stud	Plasterboard on timber frame		9.00	27.52
First Floor	Plasterboard on timber frame		9.00	98.66
GF Block	Dense block, plasterboard on dabs		75.00	43.22

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	41.65	41.65

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	41.65

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	41.65

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	41.65

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	North							2.12	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					6.94	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					4.43	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					5.40	

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)	1.91	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	11.44	0.043	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.51	0.060	No	Birtley Supatherm
Independently assessed	E3 Sill	12.34	0.034	No	CD0027
Independently assessed	E4 Jamb	30.30	0.039	No	CD0028
Independently assessed	E5 Ground floor (normal)	27.54	0.037	No	Knauf P7
Independently assessed	E6 Intermediate floor within a dwelling	27.54	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	18.62	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.92	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	20.20	0.050	No	CD0035

Y-value	0.035	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	Yes	
As Built AP ₅₀	3.95	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Night Ventilation	Yes
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	500233
Configuration	3
Manufacturer SFP	0.31
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

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Combi boiler type	Standard Combi			
Combi keep hot type	Gas/Oil, time clock			
25.0 Main Heating 2				
None				
28.0 Water Heating				
Community Heating	None			
Water Heating	HWP From main heating 1			
Flue Gas Heat Recovery System	Main Heating 1			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder				
None				
32.0 Photovoltaic Unit				
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.73	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	£27	B 89	