



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 5, Shaw Crescent
West End, Southampton, SO30 3LH

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

Report Issue Date: 13/06/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 3			Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace		
Property	5, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	12.57	TER	18.88
Environmental	91 B	% DER<TER	33.41		
CO ₂ Emissions (t/year)	0.60	DFEE	45.02	TFEE	51.18
General Requirements Compliance	Pass	% DFEE<TFEE	12.04		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.88	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.57	kgCO ₂ /m ²	Pass
	-6.31 (-33.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.18	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.02	kWh/m ² /yr	
	-6.2 (-12.1%)	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)	0.16 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.51 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.16

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

3.14 m², No overhang

Windows facing East

0.72 m², No overhang

Windows facing South

7.82 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.51 (measured in this dwelling)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Photovoltaic array	0.80	kW

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



THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 3	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Property	5, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	12.57
Environmental	91 B	TER	18.88
CO ₂ Emissions (t/year)	0.60	% DER<TER	33.41
General Requirements Compliance	Pass	DFEE	45.02
		TFEE	51.18
		% DFEE<TFEE	12.04
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	0.69	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	3.75	0.27	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.74	0.24	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	7.16	0.15	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	24.60	0.39	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	17.05	5.46	
External wall	E20 Exposed floor (normal)	Table K1 - Default	0.320	1.01	0.32	
External wall	E21 Exposed floor (inverted)	Table K1 - Default	0.320	2.07	0.66	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	15.17	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.12	0.49	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.83	0.39	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	14.20	0.55	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	4.20	-0.38	Knauf P24
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.00	0.36	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.83	1.41	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.83	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.83	0.31	Knauf P29 Halved

Total: **10.78** W/mK:
Y-Value: **0.069** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 3			Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace		
Property	5, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	88 B	DER	12.57	TER	18.88
Environmental	91 B	% DER<TER	33.41		
CO ₂ Emissions (t/year)	0.60	DFEE	45.02	TFEE	51.18
General Requirements Compliance	Pass	% DFEE<TFEE	12.04		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

End-Terrace House, total floor area 70 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) 18.88 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.57 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)45.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.16 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.51 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB)

Combi boiler

Efficiency: 89.3% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system

Specific fan power: 0.16
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing North: 3.14 m², No overhang

Windows facing East: 0.72 m², No overhang

Windows facing South: 7.82 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

Photovoltaic array 0.80 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	35.0400 (1b)	x 2.6800 (2b)	= 93.9072 (1b) - (3b)
First floor	35.3600 (1c)	x 2.3200 (2c)	= 82.0352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.9424 (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												4.5100
Infiltration rate												0.2255 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1917 (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												
	0.2444	0.2396	0.2348	0.2108	0.2061	0.1821	0.1821	0.1773	0.1917	0.2061	0.2156	0.2252 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)					
Ground Floor			35.0400	0.1200	4.2048	84.0000	2943.3600 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	84.7200	13.8300	70.8900	0.2400	17.0136	42.2200	2992.9758 (29a)					
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)					
Total net area of external elements Aum(A, m2)			155.3200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5254		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			35.3600			18.0000	636.4800 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13421.7798 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.6503 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3054 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0305	Feb 29.0305	Mar 29.0305	Apr 29.0305	May 29.0305	Jun 29.0305	Jul 29.0305	Aug 29.0305	Sep 29.0305	Oct 29.0305	Nov 29.0305	Dec 29.0305 (38)
Heat transfer coeff	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359 (39)
Average = Sum(39)m / 12 =												80.3359 (39)
HLP	Jan 1.1411	Feb 1.1411	Mar 1.1411	Apr 1.1411	May 1.1411	Jun 1.1411	Jul 1.1411	Aug 1.1411	Sep 1.1411	Oct 1.1411	Nov 1.1411	Dec 1.1411 (40)
HLP (average)												1.1411 (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												2.2558 (42)
Average daily hot water use (litres/day)												87.7752 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use	96.5527	93.0417	89.5307	86.0197	82.5087	78.9977	78.9977	82.5087	86.0197	89.5307	93.0417	96.5527 (44)
Energy conte	143.1848	125.2304	129.2265	112.6628	108.1027	93.2844	86.4417	99.1931	100.3778	116.9806	127.6935	138.6669 (45)
Energy content (annual)												1381.0452 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4777	18.7846	19.3840	16.8994	16.2154	13.9927	12.9663	14.8790	15.0567	17.5471	19.1540	20.8000 (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	1.5899	1.3399	1.3305	1.1145	1.0257	0.8475	0.7853	0.9412	0.9930	1.2044	1.3663	1.5397 (61)
Total heat required for water heating calculated for each month	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066 (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	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066 (64)
Heat gains from water heating, kWh/month	48.0064	41.9741	43.3005	37.7390	36.2006	31.2289	28.9382	33.2170	33.6239	39.1972	42.7997	46.4917 (65)
												1395.1231 (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	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3086	16.2616	13.2248	10.0120	7.4841	6.3184	6.8272	8.8743	11.9111	15.1239	17.6518	18.8175 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790 (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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319 (71)
Water heating gains (Table 5)	64.5248	62.4614	58.1995	52.4153	48.6567	43.3735	38.8954	44.6465	46.6998	52.6844	59.4440	62.4888 (72)
Total internal gains	340.8992	338.8458	326.3635	306.3313	286.1149	266.5738	253.8582	259.5994	269.8730	290.1055	313.3230	330.6257 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				3.1400	10.6334	0.6300	0.7000		0.7700		10.2041 (74)	
East				0.7200	19.6403	0.6300	0.7000		0.7700		4.3217 (76)	
South				7.8200	46.7521	0.6300	0.7000		0.7700		111.7325 (78)	
Solar gains	126.2582	210.9436	280.1543	336.9790	371.1138	366.4277	354.0511	328.3736	299.5288	230.6151	150.4177	108.6077 (83)
Total gains	467.1574	549.7894	606.5179	643.3104	657.2287	633.0015	607.9092	587.9730	569.4018	520.7206	463.7407	439.2333 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085
alpha	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939
util living area	0.9913	0.9825	0.9656	0.9289	0.8515	0.7126	0.5532	0.5900	0.7928	0.9402	0.9838	0.9932 (86)
MIT	19.5544	19.7605	20.0469	20.3838	20.6915	20.8962	20.9718	20.9628	20.8306	20.4308	19.9132	19.4970 (87)
Th 2	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674 (88)
util rest of house	0.9891	0.9780	0.9566	0.9090	0.8079	0.6287	0.4359	0.4739	0.7214	0.9194	0.9789	0.9914 (89)
MIT 2	18.6566	18.8604	19.1418	19.4666	19.7482	19.9127	19.9583	19.9543	19.8677	19.5169	19.0134	18.5996 (90)
Living area fraction	18.8904	19.0949	19.3776	19.7055	19.9939	20.1689	20.2223	20.2170	20.1186	19.7550	19.2478	18.8334 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8904	19.0949	19.3776	19.7055	19.9939	20.1689	20.2223	20.2170	20.1186	19.7550	19.2478	18.8334 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9860	0.9732	0.9502	0.9030	0.8092	0.6464	0.4662	0.5035	0.7331	0.9142	0.9745	0.9888 (94)
Ext temp.	460.5943	535.0667	576.3342	580.9019	531.8012	409.1765	283.3883	296.0479	417.4392	476.0384	451.9014	434.3126 (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	1172.1373	1140.3585	1034.5348	868.0716	666.3017	447.3817	290.9998	306.6429	483.5061	735.4744	975.9069	1175.5854 (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	529.3880	406.7561	340.9013	206.7622	100.0684	0.0000	0.0000	0.0000	0.0000	193.0204	377.2840	551.5070 (98)
Space heating per m2												2705.6874 (98)
												(98) / (4) = 38.4331 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2999.6535 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	529.3880	406.7561	340.9013	206.7622	100.0684	0.0000	0.0000	0.0000	0.0000	193.0204	377.2840	551.5070	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	586.9047	450.9491	377.9393	229.2264	110.9406	0.0000	0.0000	0.0000	0.0000	213.9916	418.2749	611.4268	(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	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066	(64)
Efficiency of water heater	86.7763	86.4314	85.8330	84.6777	82.3111	76.2000	76.2000	76.2000	76.2000	84.3169	86.1649	76.2000	(216)
Fuel for water heating, kWh/month	166.8368	146.4403	152.1059	134.3651	132.5804	123.5326	114.4711	131.4098	133.0325	140.1676	149.7823	161.2283	(219)
Water heating fuel used												1685.9526	(219)
Annual totals kWh/year													
Space heating fuel - main system												2999.6535	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													48.0815 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													123.0815 (231)
Electricity for lighting (calculated in Appendix L)													323.3360 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1080 * 1.00) =										-690.8958			-690.8958 (233)
Total delivered energy for all uses													4441.1279 (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	2999.6535	0.2160	647.9251	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1685.9526	0.2160	364.1658	(264)
Space and water heating			1012.0909	(265)
Pumps and fans	123.0815	0.5190	63.8793	(267)
Energy for lighting	323.3360	0.5190	167.8114	(268)
Energy saving/generation technologies				
PV Unit	-690.8958	0.5190	-358.5749	(269)
Total CO2, kg/year			885.2067	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5700	(273)

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

DER			12.5700	ZC1
Total Floor Area		TFA	70.4000	
Assumed number of occupants		N	2.2558	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6855	ZC2
CO2 emissions from cooking, equation (L16)			2.4594	ZC3
Total CO2 emissions			31.7149	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			31.7149	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	35.0400 (1b)	x 2.6800 (2b)	= 93.9072 (1b) - (3b)
First floor	35.3600 (1c)	x 2.3200 (2c)	= 82.0352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.9424 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1705 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4205 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3574 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)				
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)				
	0.4557	0.4468	0.4379	0.3932	0.3842	0.3396	0.3396	0.3306	0.3574	0.3842	0.4021	0.4200	(22b)				
Effective ac	0.6038	0.5998	0.5959	0.5773	0.5738	0.5577	0.5577	0.5547	0.5639	0.5738	0.5808	0.5882	(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			2.1500	1.0000	2.1500			(26)					
TER Opening Type (Uw = 1.40)			11.6800	1.3258	15.4848			(27)					
Ground Floor			35.0400	0.1300	4.5552			(28a)					
Above Entrance			0.2000	0.1300	0.0260			(28b)					
Brick and Block	84.7200	13.8300	70.8900	0.1800	12.7602			(29a)					
Pitched Roof	35.3600		35.3600	0.1300	4.5968			(30)					
Total net area of external elements Aum(A, m2)			155.3200					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.5730			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0731	(36)					
Total fabric heat loss						(33) + (36) =	49.6461	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.0598	Feb 34.8257	Mar 34.5962	Apr 33.5183	May 33.3166	Jun 32.3778	Jul 32.3778	Aug 32.2039	Sep 32.7394	Oct 33.3166	Nov 33.7246	Dec 34.1511	(38)
Heat transfer coeff	84.7059	84.4718	84.2423	83.1644	82.9627	82.0239	82.0239	81.8501	82.3855	82.9627	83.3707	83.7973	(39)
Average = Sum(39)m / 12 =												83.1635	(39)
HLP	Jan 1.2032	Feb 1.1999	Mar 1.1966	Apr 1.1813	May 1.1784	Jun 1.1651	Jul 1.1651	Aug 1.1626	Sep 1.1702	Oct 1.1784	Nov 1.1842	Dec 1.1903	(40)
HLP (average)												1.1813	(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												2.2558 (42)
Average daily hot water use (litres/day)												87.7752 (43)
Daily hot water use	Jan 96.5527	Feb 93.0417	Mar 89.5307	Apr 86.0197	May 82.5087	Jun 78.9977	Jul 78.9977	Aug 82.5087	Sep 86.0197	Oct 89.5307	Nov 93.0417	Dec 96.5527 (44)
Energy conte	143.1848	125.2304	129.2265	112.6628	108.1027	93.2844	86.4417	99.1931	100.3778	116.9806	127.6935	138.6669 (45)
Energy content (annual)										Total = Sum(45)m =		1381.0452 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4777	18.7846	19.3840	16.8994	16.2154	13.9927	12.9663	14.8790	15.0567	17.5471	19.1540	20.8000 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	49.2022	42.8247	45.6239	42.4207	42.0455	38.9577	40.2563	42.0455	42.4207	45.6239	45.8836	49.2022 (61)
Total heat required for water heating calculated for each month	192.3870	168.0550	174.8504	155.0835	150.1482	132.2421	126.6980	141.2386	142.7984	162.6045	173.5771	187.8691 (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	192.3870	168.0550	174.8504	155.0835	150.1482	132.2421	126.6980	141.2386	142.7984	162.6045	173.5771	187.8691 (64)
Heat gains from water heating, kWh/month	59.9095	52.3453	54.3738	48.0656	46.4555	40.7565	38.8059	43.4931	43.9808	50.3020	53.9290	58.4073 (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	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3086	16.2616	13.2248	10.0120	7.4841	6.3184	6.8272	8.8743	11.9111	15.1239	17.6518	18.8175 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790 (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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319 (71)
Water heating gains (Table 5)	80.5235	77.8947	73.0830	66.7577	62.4402	56.6062	52.1585	58.4584	61.0844	67.6102	74.9014	78.5044 (72)
Total internal gains	356.8979	354.2791	341.2471	320.6738	299.8984	279.8065	267.1213	273.4113	284.2576	305.0314	328.7804	346.6413 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.1400	10.6334	0.6300	0.7000	0.7700	10.2041 (74)
East	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217 (76)
South	7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)

Solar gains	126.2582	210.9436	280.1543	336.9790	371.1138	366.4277	354.0511	328.3736	299.5288	230.6151	150.4177	108.6077 (83)
Total gains	483.1561	565.2227	621.4014	657.6528	671.0122	646.2343	621.1724	601.7849	583.7864	535.6465	479.1981	455.2490 (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	57.7160	57.8760	58.0336	58.7858	58.9287	59.6032	59.6032	59.7298	59.3416	58.9287	58.6404	58.3419
alpha	4.8477	4.8584	4.8689	4.9191	4.9286	4.9735	4.9735	4.9820	4.9561	4.9286	4.9094	4.8895
util living area	0.9964	0.9917	0.9814	0.9535	0.8837	0.7361	0.5640	0.6016	0.8208	0.9615	0.9923	0.9973 (86)
MIT	19.7671	19.9431	20.1908	20.4970	20.7630	20.9344	20.9859	20.9807	20.8814	20.5385	20.0940	19.7369 (87)
Th 2	19.9174	19.9201	19.9227	19.9350	19.9373	19.9480	19.9480	19.9500	19.9439	19.9373	19.9326	19.9278 (88)
util rest of house	0.9952	0.9890	0.9748	0.9361	0.8388	0.6436	0.4378	0.4761	0.7432	0.9436	0.9892	0.9964 (89)
MIT 2	18.2879	18.5458	18.9056	19.3481	19.7030	19.9037	19.9428	19.9421	19.8513	19.4140	18.7756	18.2512 (90)
Living area fraction									fLA = Living area / (4) =			0.2605 (91)
MIT	18.6733	18.9098	19.2404	19.6474	19.9791	20.1722	20.2146	20.2127	20.1196	19.7069	19.1191	18.6383 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6733	18.9098	19.2404	19.6474	19.9791	20.1722	20.2146	20.2127	20.1196	19.7069	19.1191	18.6383 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9931	0.9854	0.9693	0.9302	0.8409	0.6649	0.4709	0.5089	0.7578	0.9386	0.9859	0.9947 (94)
Ext temp.	479.8396	556.9661	602.3455	611.7737	564.2396	429.7025	292.5185	306.2522	442.4166	502.7490	472.4251	452.8553 (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	1217.5003	1183.4324	1073.2796	893.7985	686.8603	457.0526	296.4808	312.0677	495.9307	755.5351	1002.0404	1209.8872 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating	548.8195	420.9853	350.3750	203.0579	91.2299	0.0000	0.0000	0.0000	0.0000	188.0729	381.3230	563.2317 (98)
Space heating per m2												2747.0952 (98)
										(98) / (4) =		39.0212 (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													2941.2155 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	548.8195	420.9853	350.3750	203.0579	91.2299	0.0000	0.0000	0.0000	0.0000	188.0729	381.3230	563.2317	(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)	587.6012	450.7338	375.1338	217.4067	97.6765	0.0000	0.0000	0.0000	0.0000	201.3629	408.2687	603.0318	(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	192.3870	168.0550	174.8504	155.0835	150.1482	132.2421	126.6980	141.2386	142.7984	162.6045	173.5771	187.8691	(64)
Efficiency of water heater (217)m	87.5420	87.2684	86.7669	85.7307	83.8403	80.3000	80.3000	80.3000	80.3000	85.4183	86.9779	87.6427	(217)
Fuel for water heating, kWh/month	219.7654	192.5727	201.5175	180.8961	179.0882	164.6851	157.7809	175.8887	177.8312	190.3627	199.5646	214.3578	(219)
Water heating fuel used												2254.3107	(219)
Annual totals kWh/year													
Space heating fuel - main system												2941.2155	(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)												323.3360	(232)
Total delivered energy for all uses												5593.8622	(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	2941.2155	0.2160	635.3025 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2254.3107	0.2160	486.9311 (264)
Space and water heating			1122.2337 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3360	0.5190	167.8114 (268)
Total CO2, kg/m2/year			1328.9700 (272)
Emissions per m2 for space and water heating			15.9408 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3837 (272b)
Emissions per m2 for pumps and fans			0.5529 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9408 * 1.00) + 2.3837 + 0.5529, rounded to 2 d.p.			18.8800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.0400 (1b)	x 2.6800 (2b)	= 93.9072 (1b) - (3b)
First floor	35.3600 (1c)	x 2.3200 (2c)	= 82.0352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.9424 (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) = 0.1705 (8)
Pressure test					Yes
Measured/design AP50					4.5100
Infiltration rate					0.3960 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3366 (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	0.4292	0.4208	0.4123	0.3703	0.3619	0.3198	0.3198	0.3114	0.3366	0.3619	0.3787	0.3955 (22b)
Effective ac	0.5921	0.5885	0.5850	0.5685	0.5655	0.5511	0.5511	0.5485	0.5567	0.5655	0.5717	0.5782 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)
Ground Floor			35.0400	0.1200	4.2048	84.0000	2943.3600 (28a)
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)
Brick and Block	84.7200	13.8300	70.8900	0.2400	17.0136	42.2200	2992.9758 (29a)
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)
Total net area of external elements Aum(A, m ²)			155.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5254		(33)
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)
First Floor Stud			59.2300			9.0000	533.0700 (32c)
Internal Floor 1			35.3600			18.0000	636.4800 (32d)
Internal Ceiling 1			35.0400			9.0000	315.3600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13106.4198 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 186.1707 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7800 (36)
Total fabric heat loss (33) + (36) = 51.3054 (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	34.3777	34.1700	33.9665	33.0106	32.8317	31.9991	31.9991	31.8449	32.3198	32.8317	33.1935	33.5718 (38)
Heat transfer coeff	85.6831	85.4755	85.2720	84.3160	84.1372	83.3045	83.3045	83.1504	83.6253	84.1372	84.4990	84.8773 (39)
Average = Sum(39)m / 12 =												84.3152 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2171	1.2141	1.2112	1.1977	1.1951	1.1833	1.1833	1.1811	1.1879	1.1951	1.2003	1.2056 (40)
HLP (average)												1.1977 (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 2.2558 (42)
Average daily hot water use (litres/day) 87.7752 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.5527	93.0417	89.5307	86.0197	82.5087	78.9977	78.9977	82.5087	86.0197	89.5307	93.0417	96.5527 (44)
Energy conte	143.1848	125.2304	129.2265	112.6628	108.1027	93.2844	86.4417	99.1931	100.3778	116.9806	127.6935	138.6669 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1381.0452 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.4268	26.6115	27.4606	23.9409	22.9718	19.8229	18.3689	21.0785	21.3303	24.8584	27.1349	29.4667 (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	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3086	16.2616	13.2248	10.0120	7.4841	6.3184	6.8272	8.8743	11.9111	15.1239	17.6518	18.8175	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	(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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	(71)
Water heating gains (Table 5)	40.8962	39.6004	36.9095	33.2512	30.8761	27.5318	24.6893	28.3314	29.6254	33.4118	37.6873	39.6058	(72)
Total internal gains	314.2706	312.9847	302.0735	284.1672	265.3343	247.7321	236.6521	240.2842	249.7986	267.8329	288.5663	304.7427	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				3.1400	10.6334	0.6300	0.7000	0.7700		10.2041 (74)		
East				0.7200	19.6403	0.6300	0.7000	0.7700		4.3217 (76)		
South				7.8200	46.7521	0.6300	0.7000	0.7700		111.7325 (78)		

Solar gains	126.2582	210.9436	280.1543	336.9790	371.1138	366.4277	354.0511	328.3736	299.5288	230.6151	150.4177	108.6077 (83)
Total gains	440.5288	523.9283	582.2278	621.1463	636.4481	614.1599	590.7032	568.6578	549.3274	498.4480	438.9840	413.3504 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	42.4900	42.5932	42.6948	43.1789	43.2707	43.7032	43.7032	43.7842	43.5356	43.2707	43.0854	42.8934
alpha	3.8327	3.8395	3.8463	3.8786	3.8847	3.9135	3.9135	3.9189	3.9024	3.8847	3.8724	3.8596
util living area	0.9924	0.9847	0.9700	0.9373	0.8684	0.7367	0.5803	0.6184	0.8151	0.9483	0.9860	0.9940 (86)
MIT	19.3641	19.5829	19.8928	20.2758	20.6198	20.8661	20.9606	20.9488	20.7858	20.3344	19.7744	19.3247 (87)
Th 2	19.9064	19.9087	19.9110	19.9219	19.9239	19.9334	19.9334	19.9351	19.9297	19.9239	19.9198	19.9155 (88)
util rest of house	0.9904	0.9807	0.9620	0.9192	0.8271	0.6526	0.4568	0.4973	0.7460	0.9297	0.9818	0.9925 (89)
MIT 2	18.4233	18.6419	18.9492	19.3293	19.6501	19.8613	19.9203	19.9167	19.8009	19.3927	18.8419	18.3911 (90)
Living area fraction	18.6684	18.8870	19.1950	19.5759	19.9027	20.1231	20.1913	20.1856	20.0575	19.6381	19.0849	18.6343 (91)
MIT	18.6684	18.8870	19.1950	19.5759	19.9027	20.1231	20.1913	20.1856	20.0575	19.6381	19.0849	18.6343 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6684	18.8870	19.1950	19.5759	19.9027	20.1231	20.1913	20.1856	20.0575	19.6381	19.0849	18.6343 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	434.9822	511.3035	556.1699	566.5470	525.8168	410.9293	288.4928	300.1306	414.9765	460.3221	429.0455	409.1952	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1231.1321	1195.5492	1082.5307	900.1493	690.1516	460.0954	299.1741	314.7699	498.1990	760.4360	1012.7091	1225.1437	(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	592.3355	459.8131	391.6125	240.1937	122.2651	0.0000	0.0000	0.0000	0.0000	223.2848	420.2378	607.0657	(98)
Space heating												3056.8081	(98)
Space heating per m2												43.4206	(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	783.0628	616.4537	631.9427	0.0000	0.0000	0.0000	0.0000	(100)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8058	0.8755	0.8581	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	631.0289	539.6818	542.2431	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	801.9219	772.8310	748.5080	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	123.0430	173.4630	153.4611	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												449.9671 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	30.7607	43.3658	38.3653	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												112.4918 (107)
Space cooling per m2												1.5979 (108)
Energy for space heating												43.4206 (99)
Energy for space cooling												1.5979 (108)
Total												45.0185 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.0 (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	35.0400 (1b)	x 2.6800 (2b)	= 93.9072 (1b) - (3b)
First floor	35.3600 (1c)	x 2.3200 (2c)	= 82.0352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.9424 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1705 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4205 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3574 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)				
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)				
	0.4557	0.4468	0.4379	0.3932	0.3842	0.3396	0.3396	0.3306	0.3574	0.3842	0.4021	0.4200	(22b)				
Effective ac	0.6038	0.5998	0.5959	0.5773	0.5738	0.5577	0.5577	0.5547	0.5639	0.5738	0.5808	0.5882	(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			2.1500	1.0000	2.1500			(26)					
TER Opening Type (Uw = 1.40)			11.6800	1.3258	15.4848			(27)					
Ground Floor			35.0400	0.1300	4.5552			(28a)					
Above Entrance			0.2000	0.1300	0.0260			(28b)					
Brick and Block	84.7200	13.8300	70.8900	0.1800	12.7602			(29a)					
Pitched Roof	35.3600		35.3600	0.1300	4.5968			(30)					
Total net area of external elements Aum(A, m2)			155.3200					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.5730			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0731	(36)					
Total fabric heat loss						(33) + (36) =	49.6461	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.0598	Feb 34.8257	Mar 34.5962	Apr 33.5183	May 33.3166	Jun 32.3778	Jul 32.3778	Aug 32.2039	Sep 32.7394	Oct 33.3166	Nov 33.7246	Dec 34.1511	(38)
Heat transfer coeff	84.7059	84.4718	84.2423	83.1644	82.9627	82.0239	82.0239	81.8501	82.3855	82.9627	83.3707	83.7973	(39)
Average = Sum(39)m / 12 =												83.1635	(39)
HLP	Jan 1.2032	Feb 1.1999	Mar 1.1966	Apr 1.1813	May 1.1784	Jun 1.1651	Jul 1.1651	Aug 1.1626	Sep 1.1702	Oct 1.1784	Nov 1.1842	Dec 1.1903	(40)
HLP (average)												1.1813	(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												2.2558 (42)
Average daily hot water use (litres/day)												87.7752 (43)
Daily hot water use	Jan 96.5527	Feb 93.0417	Mar 89.5307	Apr 86.0197	May 82.5087	Jun 78.9977	Jul 78.9977	Aug 82.5087	Sep 86.0197	Oct 89.5307	Nov 93.0417	Dec 96.5527 (44)
Energy conte	143.1848	125.2304	129.2265	112.6628	108.1027	93.2844	86.4417	99.1931	100.3778	116.9806	127.6935	138.6669 (45)
Energy content (annual)										Total = Sum(45)m =		1381.0452 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	30.4268	26.6115	27.4606	23.9409	22.9718	19.8229	18.3689	21.0785	21.3303	24.8584	27.1349	29.4667 (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	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3086	16.2616	13.2248	10.0120	7.4841	6.3184	6.8272	8.8743	11.9111	15.1239	17.6518	18.8175	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	(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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	(71)
Water heating gains (Table 5)	40.8962	39.6004	36.9095	33.2512	30.8761	27.5318	24.6893	28.3314	29.6254	33.4118	37.6873	39.6058	(72)
Total internal gains	314.2706	312.9847	302.0735	284.1672	265.3343	247.7321	236.6521	240.2842	249.7986	267.8329	288.5663	304.7427	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					3.1400	10.6334		0.6300	0.7000	0.7700		10.2041 (74)	
East					0.7200	19.6403		0.6300	0.7000	0.7700		4.3217 (76)	
South					7.8200	46.7521		0.6300	0.7000	0.7700		111.7325 (78)	
Solar gains	126.2582	210.9436	280.1543	336.9790	371.1138	366.4277	354.0511	328.3736	299.5288	230.6151	150.4177	108.6077	(83)
Total gains	440.5288	523.9283	582.2278	621.1463	636.4481	614.1599	590.7032	568.6578	549.3274	498.4480	438.9840	413.3504	(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	57.7160	57.8760	58.0336	58.7858	58.9287	59.6032	59.6032	59.7298	59.3416	58.9287	58.6404	58.3419	
alpha	4.8477	4.8584	4.8689	4.9191	4.9286	4.9735	4.9735	4.9820	4.9561	4.9286	4.9094	4.8895	
util living area	0.9976	0.9940	0.9856	0.9622	0.9004	0.7613	0.5893	0.6308	0.8460	0.9706	0.9947	0.9982	(86)
MIT	19.7116	19.8905	20.1433	20.4579	20.7365	20.9236	20.9830	20.9763	20.8621	20.4970	20.0425	19.6821	(87)
Th 2	19.9174	19.9201	19.9227	19.9350	19.9373	19.9480	19.9480	19.9500	19.9439	19.9373	19.9326	19.9278	(88)
util rest of house	0.9968	0.9920	0.9804	0.9474	0.8595	0.6701	0.4593	0.5020	0.7729	0.9562	0.9925	0.9976	(89)
MIT 2	18.7498	18.9298	19.1820	19.4983	19.7563	19.9119	19.9436	19.9432	19.8683	19.5418	19.0919	18.7285	(90)
Living area fraction	19.0003	19.1801	19.4325	19.7483	20.0117	20.1755	20.2144	20.2123	20.1272	19.7906	19.3395	18.9769	(92)
MIT	19.0003	19.1801	19.4325	19.7483	20.0117	20.1755	20.2144	20.2123	20.1272	19.7906	19.3395	18.9769	(93)
Temperature adjustment													
adjusted MIT	19.0003	19.1801	19.4325	19.7483	20.0117	20.1755	20.2144	20.2123	20.1272	19.7906	19.3395	18.9769	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9958	0.9901	0.9774	0.9442	0.8628	0.6917	0.4936	0.5359	0.7875	0.9537	0.9909	0.9969	(94)
Useful gains	438.6764	518.7337	569.0667	586.4909	549.1359	424.7866	291.5988	304.7575	432.5865	475.3476	434.9780	412.0598	(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	1245.2054	1206.2662	1089.4603	902.1894	689.5575	457.3212	296.4672	312.0401	496.5543	762.4775	1020.4188	1238.2654	(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	600.0576	462.0218	387.1729	227.3029	104.4736	0.0000	0.0000	0.0000	0.0000	213.6246	421.5173	614.6970	(98)
Space heating												3030.8678	(98)
Space heating per m2												43.0521	(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	771.0250	606.9771	622.0606	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8485	0.9155	0.8996	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	654.2272	555.6845	559.6195	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	801.9219	772.8310	748.5080	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	106.3402	161.5570	140.5331	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												408.4302 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	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	26.5850	40.3893	35.1333	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												102.1076 (107)
Space cooling per m2												1.4504 (108)
Energy for space heating												43.0521 (99)
Energy for space cooling												1.4504 (108)
Total												44.5025 (109)
Target Fabric Energy Efficiency (TFEE)												51.2 (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	35.0400 (1b)	x 2.6800 (2b)	= 93.9072 (1b) - (3b)
First floor	35.3600 (1c)	x 2.3200 (2c)	= 82.0352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.9424 (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												4.5100
Infiltration rate												0.2255 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1917 (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												
	0.2252	0.2108	0.2108	0.1917	0.1965	0.1869	0.1869	0.1821	0.1821	0.1965	0.1917	0.1965 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												
	0.5000 (23a)											
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)					
Ground Floor			35.0400	0.1200	4.2048	84.0000	2943.3600 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	84.7200	13.8300	70.8900	0.2400	17.0136	42.2200	2992.9758 (29a)					
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)					
Total net area of external elements Aum(A, m2)			155.3200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5254		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			35.3600			18.0000	636.4800 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13421.7798 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.6503 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3054 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0305	Feb 29.0305	Mar 29.0305	Apr 29.0305	May 29.0305	Jun 29.0305	Jul 29.0305	Aug 29.0305	Sep 29.0305	Oct 29.0305	Nov 29.0305	Dec 29.0305 (38)
Heat transfer coeff	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359 (39)
Average = Sum(39)m / 12 =												80.3359 (39)
HLP	Jan 1.1411	Feb 1.1411	Mar 1.1411	Apr 1.1411	May 1.1411	Jun 1.1411	Jul 1.1411	Aug 1.1411	Sep 1.1411	Oct 1.1411	Nov 1.1411	Dec 1.1411 (40)
HLP (average)												1.1411 (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												2.2558 (42)
Average daily hot water use (litres/day)												87.7752 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Daily hot water use	96.5527	93.0417	89.5307	86.0197	82.5087	78.9977	78.9977	82.5087	86.0197	89.5307	93.0417	96.5527 (44)
Energy conte	143.1848	125.2304	129.2265	112.6628	108.1027	93.2844	86.4417	99.1931	100.3778	116.9806	127.6935	138.6669 (45)
Energy content (annual)										Total =	Sum (45)m =	1381.0452 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4777	18.7846	19.3840	16.8994	16.2154	13.9927	12.9663	14.8790	15.0567	17.5471	19.1540	20.8000 (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	1.5899	1.3399	1.3305	1.1145	1.0257	0.8475	0.7853	0.9412	0.9930	1.2044	1.3663	1.5397 (61)
Total heat required for water heating calculated for each month	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066 (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	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	48.0064	41.9741	43.3005	37.7390	36.2006	31.2289	28.9382	33.2170	33.6239	39.1972	42.7997	46.4917 (65)
												1395 (64)
												1395 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.7716	40.6539	33.0620	25.0300	18.7102	15.7960	17.0681	22.1858	29.7777	37.8096	44.1294	47.0437 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.8639	298.9341	291.1974	274.7270	253.9360	234.3955	221.3412	218.2710	226.0077	242.4781	263.2691	282.8096 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906 (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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319 (71)
Water heating gains (Table 5)	64.5248	62.4614	58.1995	52.4153	48.6567	43.3735	38.8954	44.6465	46.6998	52.6844	59.4440	62.4888 (72)
Total internal gains	505.0668	500.9559	481.3654	451.0788	420.2095	392.4714	376.2112	384.0098	401.3917	431.8786	465.7490	491.2486 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
North		3.1400	13.4684	0.6300	0.7000	0.7700	12.9246 (74)
East		0.7200	25.1733	0.6300	0.7000	0.7700	5.5392 (76)
South		7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)

Solar gains	153.6988	218.3236	295.6288	359.4763	375.6113	412.0236	381.8283	366.8936	331.5802	257.5620	182.4311	125.2215 (83)
Total gains	658.7656	719.2796	776.9942	810.5552	795.8207	804.4951	758.0395	750.9035	732.9719	689.4407	648.1801	616.4702 (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	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085
alpha	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939
util living area	0.9631	0.9475	0.9096	0.8334	0.7040	0.4930	0.3466	0.3395	0.5787	0.8180	0.9323	0.9695 (86)
MIT	20.0082	20.1385	20.3916	20.6707	20.8776	20.9784	20.9961	20.9965	20.9577	20.7515	20.3552	19.9609 (87)
Th 2	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674 (88)
util rest of house	0.9542	0.9351	0.8884	0.7946	0.6371	0.4001	0.2398	0.2314	0.4854	0.7673	0.9136	0.9619 (89)
MIT 2	19.1024	19.2278	19.4684	19.7228	19.8939	19.9593	19.9667	19.9668	19.9491	19.7978	19.4391	19.0571 (90)
Living area fraction	19.3384	19.4650	19.7089	19.9698	20.1501	20.2248	20.2349	20.2351	fLA = Living area / (4) =	20.2119	20.0463	19.6778 (91)
MIT	19.3384	19.4650	19.7089	19.9698	20.1501	20.2248	20.2349	20.2351	20.2119	20.0463	19.6778	19.2925 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3384	19.4650	19.7089	19.9698	20.1501	20.2248	20.2349	20.2351	20.2119	20.0463	19.6778	19.2925 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	624.1559	667.4537	685.5734	644.1782	517.0871	341.0018	202.9564	195.0361	372.7234	531.9728	588.1359	589.1420 (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	1103.6859	1081.7265	972.7807	792.8976	566.3796	347.4370	203.6429	195.6240	386.5650	638.3716	889.9422	1091.9699 (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	356.7703	278.3913	213.6822	107.0780	36.6737	0.0000	0.0000	0.0000	0.0000	79.1607	217.3005	374.1040 (98)
Space heating												1663.1607 (98)
RHI space heating demand												1663 (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	35.0400 (1b)	x 2.6800 (2b)	= 93.9072 (1b) - (3b)
First floor	35.3600 (1c)	x 2.3200 (2c)	= 82.0352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.9424 (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												4.5100
Infiltration rate												0.2255 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1917 (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												
	0.2444	0.2396	0.2348	0.2108	0.2061	0.1821	0.1821	0.1773	0.1917	0.2061	0.2156	0.2252 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)					
Ground Floor			35.0400	0.1200	4.2048	84.0000	2943.3600 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	84.7200	13.8300	70.8900	0.2400	17.0136	42.2200	2992.9758 (29a)					
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)					
Total net area of external elements Aum(A, m2)			155.3200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5254		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			35.3600			18.0000	636.4800 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13421.7798 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.6503 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3054 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0305	Feb 29.0305	Mar 29.0305	Apr 29.0305	May 29.0305	Jun 29.0305	Jul 29.0305	Aug 29.0305	Sep 29.0305	Oct 29.0305	Nov 29.0305	Dec 29.0305 (38)
Heat transfer coeff	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359 (39)
Average = Sum(39)m / 12 =												80.3359 (39)
HLP	Jan 1.1411	Feb 1.1411	Mar 1.1411	Apr 1.1411	May 1.1411	Jun 1.1411	Jul 1.1411	Aug 1.1411	Sep 1.1411	Oct 1.1411	Nov 1.1411	Dec 1.1411 (40)
HLP (average)												1.1411 (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												2.2558 (42)
Average daily hot water use (litres/day)												87.7752 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Daily hot water use	96.5527	93.0417	89.5307	86.0197	82.5087	78.9977	78.9977	82.5087	86.0197	89.5307	93.0417	96.5527 (44)
Energy conte	143.1848	125.2304	129.2265	112.6628	108.1027	93.2844	86.4417	99.1931	100.3778	116.9806	127.6935	138.6669 (45)
Energy content (annual)												1381.0452 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4777	18.7846	19.3840	16.8994	16.2154	13.9927	12.9663	14.8790	15.0567	17.5471	19.1540	20.8000 (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	1.5899	1.3399	1.3305	1.1145	1.0257	0.8475	0.7853	0.9412	0.9930	1.2044	1.3663	1.5397 (61)
Total heat required for water heating calculated for each month	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066 (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	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066 (64)
Heat gains from water heating, kWh/month	48.0064	41.9741	43.3005	37.7390	36.2006	31.2289	28.9382	33.2170	33.6239	39.1972	42.7997	46.4917 (65)
												1395.1231 (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	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.7716	40.6539	33.0620	25.0300	18.7102	15.7960	17.0681	22.1858	29.7777	37.8096	44.1294	47.0437 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.8639	298.9341	291.1974	274.7270	253.9360	234.3955	221.3412	218.2710	226.0077	242.4781	263.2691	282.8096 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906 (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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319 (71)
Water heating gains (Table 5)	64.5248	62.4614	58.1995	52.4153	48.6567	43.3735	38.8954	44.6465	46.6998	52.6844	59.4440	62.4888 (72)
Total internal gains	505.0668	500.9559	481.3654	451.0788	420.2095	392.4714	376.2112	384.0098	401.3917	431.8786	465.7490	491.2486 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North					3.1400	10.6334		0.6300	0.7000	0.7700	10.2041 (74)	
East					0.7200	19.6403		0.6300	0.7000	0.7700	4.3217 (76)	
South					7.8200	46.7521		0.6300	0.7000	0.7700	111.7325 (78)	
Solar gains	126.2582	210.9436	280.1543	336.9790	371.1138	366.4277	354.0511	328.3736	299.5288	230.6151	150.4177	108.6077 (83)
Total gains	631.3250	711.8995	761.5197	788.0579	791.3233	758.8992	730.2622	712.3834	700.9205	662.4937	616.1667	599.8563 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085
alpha	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939
util living area	0.9753	0.9590	0.9314	0.8779	0.7799	0.6260	0.4709	0.5011	0.7001	0.8845	0.9587	0.9796 (86)
MIT	19.8055	19.9951	20.2503	20.5389	20.7862	20.9357	20.9842	20.9793	20.8953	20.5894	20.1346	19.7461 (87)
Th 2	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674 (88)
util rest of house	0.9695	0.9498	0.9156	0.8489	0.7278	0.5425	0.3664	0.3965	0.6225	0.8513	0.9477	0.9748 (89)
MIT 2	18.9034	19.0881	19.3344	19.6052	19.8222	19.9353	19.9625	19.9605	19.9097	19.6571	19.2273	18.8452 (90)
Living area fraction									fLA = Living area / (4) =			0.2605 (91)
MIT	19.1385	19.3244	19.5730	19.8484	20.0733	20.1959	20.2287	20.2259	20.1665	19.9000	19.4636	19.0799 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1385	19.3244	19.5730	19.8484	20.0733	20.1959	20.2287	20.2259	20.1665	19.9000	19.4636	19.0799 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9637	0.9427	0.9085	0.8452	0.7336	0.5620	0.3936	0.4235	0.6385	0.8488	0.9411	0.9695 (94)
Ext temp.	608.4163	671.1327	691.8150	666.0390	580.5243	426.4685	287.3966	301.6868	447.5622	562.3191	579.8500	581.5490 (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	1192.0610	1158.8000	1050.2285	879.5537	672.6763	449.5538	291.5151	307.3611	487.3541	747.1216	993.2426	1195.3889 (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	434.2317	327.7124	266.6596	153.7306	68.5611	0.0000	0.0000	0.0000	0.0000	137.4930	297.6427	456.6969 (98)
Space heating per m2												2142.7280 (98)
												(98) / (4) = 30.4365 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2375.5299 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	434.2317	327.7124	266.6596	153.7306	68.5611	0.0000	0.0000	0.0000	0.0000	137.4930	297.6427	456.6969	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	481.4098	363.3175	295.6315	170.4330	76.0101	0.0000	0.0000	0.0000	0.0000	152.4313	329.9808	506.3159	(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	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066	(64)
Efficiency of water heater (217)m	86.2383	85.8076	85.0633	83.6623	81.0541	76.2000	76.2000	76.2000	76.2000	83.1393	85.4515	76.2000	(216)
Fuel for water heating, kWh/month	167.8775	147.5048	153.4823	135.9959	134.6364	123.5326	114.4711	131.4098	133.0325	142.1531	151.0328	162.1478	(219)
Water heating fuel used												1697.2767	(219)
Annual totals kWh/year													
Space heating fuel - main system												2375.5299	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													48.0815 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													123.0815 (231)
Electricity for lighting (calculated in Appendix L)													323.3360 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1080 * 1.00) =										-690.8958			-690.8958 (233)
Total delivered energy for all uses													3828.3284 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2375.5299	3.4800	82.6684 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1697.2767	3.4800	59.0652 (247)
Mechanical ventilation fans	48.0815	13.1900	6.3420 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	323.3360	13.1900	42.6480 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-690.8958	13.1900	-91.1292 (252)
Total energy cost			229.4870 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.8352 (257)
SAP rating (Section 12)		88.3487
SAP band		88 (258)
		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2375.5299	0.2160	513.1145 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1697.2767	0.2160	366.6118 (264)
Space and water heating			879.7262 (265)
Pumps and fans	123.0815	0.5190	63.8793 (267)
Energy for lighting	323.3360	0.5190	167.8114 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total kg/year			752.8420 (272)
CO2 emissions per m2			10.6900 (273)
EI value			91.2582
EI rating			91 (274)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI band

B

Calculation of stars for heating and DHW

Main heating energy efficiency $3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact $0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency $3.48 / 0.8181 = 4.254$, stars = 4
Water heating environmental impact $0.216 / 0.8181 = 0.2640$, 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	35.0400 (1b)	x 2.6800 (2b)	= 93.9072 (1b) - (3b)
First floor	35.3600 (1c)	x 2.3200 (2c)	= 82.0352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.9424 (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												4.5100
Infiltration rate												0.2255 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1917 (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												
	0.2252	0.2108	0.2108	0.1917	0.1965	0.1869	0.1869	0.1821	0.1821	0.1965	0.1917	0.1965 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)					
Ground Floor			35.0400	0.1200	4.2048	84.0000	2943.3600 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	84.7200	13.8300	70.8900	0.2400	17.0136	42.2200	2992.9758 (29a)					
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)					
Total net area of external elements Aum(A, m2)			155.3200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5254		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			35.3600			18.0000	636.4800 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13421.7798 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.6503 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3054 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0305	Feb 29.0305	Mar 29.0305	Apr 29.0305	May 29.0305	Jun 29.0305	Jul 29.0305	Aug 29.0305	Sep 29.0305	Oct 29.0305	Nov 29.0305	Dec 29.0305 (38)
Heat transfer coeff	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359 (39)
Average = Sum(39)m / 12 =												80.3359 (39)
HLP	Jan 1.1411	Feb 1.1411	Mar 1.1411	Apr 1.1411	May 1.1411	Jun 1.1411	Jul 1.1411	Aug 1.1411	Sep 1.1411	Oct 1.1411	Nov 1.1411	Dec 1.1411 (40)
HLP (average)												1.1411 (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												2.2558 (42)
Average daily hot water use (litres/day)												87.7752 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	96.5527	93.0417	89.5307	86.0197	82.5087	78.9977	78.9977	82.5087	86.0197	89.5307	93.0417	96.5527 (44)
Energy conte	143.1848	125.2304	129.2265	112.6628	108.1027	93.2844	86.4417	99.1931	100.3778	116.9806	127.6935	138.6669 (45)
Energy content (annual)												1381.0452 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4777	18.7846	19.3840	16.8994	16.2154	13.9927	12.9663	14.8790	15.0567	17.5471	19.1540	20.8000 (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	1.5899	1.3399	1.3305	1.1145	1.0257	0.8475	0.7853	0.9412	0.9930	1.2044	1.3663	1.5397 (61)
Total heat required for water heating calculated for each month	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066 (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	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066 (64)
Heat gains from water heating, kWh/month	48.0064	41.9741	43.3005	37.7390	36.2006	31.2289	28.9382	33.2170	33.6239	39.1972	42.7997	46.4917 (65)
												1395.1231 (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	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.7716	40.6539	33.0620	25.0300	18.7102	15.7960	17.0681	22.1858	29.7777	37.8096	44.1294	47.0437 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.8639	298.9341	291.1974	274.7270	253.9360	234.3955	221.3412	218.2710	226.0077	242.4781	263.2691	282.8096 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906 (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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319 (71)
Water heating gains (Table 5)	64.5248	62.4614	58.1995	52.4153	48.6567	43.3735	38.8954	44.6465	46.6998	52.6844	59.4440	62.4888 (72)
Total internal gains	505.0668	500.9559	481.3654	451.0788	420.2095	392.4714	376.2112	384.0098	401.3917	431.8786	465.7490	491.2486 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				3.1400	13.4684		0.6300		0.7000		0.7700		12.9246 (74)
East				0.7200	25.1733		0.6300		0.7000		0.7700		5.5392 (76)
South				7.8200	56.5862		0.6300		0.7000		0.7700		135.2350 (78)
Solar gains	153.6988	218.3236	295.6288	359.4763	375.6113	412.0236	381.8283	366.8936	331.5802	257.5620	182.4311	125.2215	(83)
Total gains	658.7656	719.2796	776.9942	810.5552	795.8207	804.4951	758.0395	750.9035	732.9719	689.4407	648.1801	616.4702	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085
alpha	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939
util living area	0.9631	0.9475	0.9096	0.8334	0.7040	0.4930	0.3466	0.3395	0.5787	0.8180	0.9323	0.9695 (86)
MIT	20.0082	20.1385	20.3916	20.6707	20.8776	20.9784	20.9961	20.9965	20.9577	20.7515	20.3552	19.9609 (87)
Th 2	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674 (88)
util rest of house	0.9542	0.9351	0.8884	0.7946	0.6371	0.4001	0.2398	0.2314	0.4854	0.7673	0.9136	0.9619 (89)
MIT 2	19.1024	19.2278	19.4684	19.7228	19.8939	19.9593	19.9667	19.9668	19.9491	19.7978	19.4391	19.0571 (90)
Living area fraction									fLA = Living area / (4) =			0.2605 (91)
MIT	19.3384	19.4650	19.7089	19.9698	20.1501	20.2248	20.2349	20.2351	20.2119	20.0463	19.6778	19.2925 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3384	19.4650	19.7089	19.9698	20.1501	20.2248	20.2349	20.2351	20.2119	20.0463	19.6778	19.2925 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9475	0.9279	0.8823	0.7947	0.6498	0.4239	0.2677	0.2597	0.5085	0.7716	0.9074	0.9557 (94)
Ext temp.	624.1559	667.4537	685.5734	644.1782	517.0871	341.0018	202.9564	195.0361	372.7234	531.9728	588.1359	589.1420 (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	1103.6859	1081.7265	972.7807	792.8976	566.3796	347.4370	203.6429	195.6240	386.5650	638.3716	889.9422	1091.9699 (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	356.7703	278.3913	213.6822	107.0780	36.6737	0.0000	0.0000	0.0000	0.0000	79.1607	217.3005	374.1040 (98)
Space heating per m2												1663.1607 (98)
										(98) / (4) =		23.6244 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1843.8589 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	356.7703	278.3913	213.6822	107.0780	36.6737	0.0000	0.0000	0.0000	0.0000	79.1607	217.3005	374.1040	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	395.5325	308.6378	236.8983	118.7117	40.6582	0.0000	0.0000	0.0000	0.0000	87.7613	240.9096	414.7495	(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	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066	(64)
Efficiency of water heater (217)m	85.6572	85.3017	84.3242	82.4008	79.2957	76.2000	76.2000	76.2000	76.2000	81.2591	84.4206	76.2000	(216)
Fuel for water heating, kWh/month	169.0163	148.3797	154.8275	138.0780	137.6220	123.5326	114.4711	131.4098	133.0325	145.4422	152.8772	163.2250	(219)
Water heating fuel used												1711.9139	(219)
Annual totals kWh/year													
Space heating fuel - main system												1843.8589	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													48.0815 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													123.0815 (231)
Electricity for lighting (calculated in Appendix L)													323.3360 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1206 * 1.00) =										-771.8465			-771.8465 (233)
Total delivered energy for all uses													3230.3438 (238)

10a. Fuel costs - using BEDF prices (548)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1843.8589	7.3800	136.0768 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1711.9139	7.3800	126.3392 (247)
Mechanical ventilation fans	48.0815	28.6600	13.7802 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Energy for lighting	323.3360	28.6600	92.6681 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-771.8465	28.6600	-221.2112 (252)
Total energy cost			276.1481 (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	1843.8589	0.2160	398.2735 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1711.9139	0.2160	369.7734 (264)
Space and water heating			768.0469 (265)
Pumps and fans	123.0815	0.5190	63.8793 (267)
Energy for lighting	323.3360	0.5190	167.8114 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	0.5190	-400.5884 (269)
Total kg/year			599.1493 (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	1843.8589	1.2200	2249.5079 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1711.9139	1.2200	2088.5350 (264)
Space and water heating			4338.0429 (265)
Pumps and fans	123.0815	3.0700	377.8603 (267)
Energy for lighting	323.3360	3.0700	992.6416 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies
PV Unit -771.8465 3.0700 -2369.5689 (269)
Primary energy kWh/year 3338.9758 (272)
Primary energy kWh/m2/year 47.4286 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 88
Current environmental impact rating: B 91

(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	+ 1.4	-£ 61	-195 kg (32.5%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£61 2.77 kg/m²	B 90	A 93
Total Savings	£61 2.77 kg/m²		

Potential energy efficiency rating: B 90
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 548 TEST (07 Jun 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£128	£142	-£14
Mains gas	£369	£294	£75
Space heating	£278	£278	£0
Water heating	£126	£65	£61
Lighting	£93	£93	£0
Generated (PV)	-£221	-£221	£0
Total cost of fuels	£276	£215	£61
Total cost of uses	£276	£215	£61
Delivered energy	46 kWh/m²	32 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.4 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	6 kg/m²	3 kg/m²
Primary energy	47 kWh/m²	32 kWh/m²	16 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	35.0400 (1b)	x 2.6800 (2b)	= 93.9072 (1b) - (3b)
First floor	35.3600 (1c)	x 2.3200 (2c)	= 82.0352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.9424 (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												4.5100
Infiltration rate												0.2255 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1917 (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												
	0.2444	0.2396	0.2348	0.2108	0.2061	0.1821	0.1821	0.1773	0.1917	0.2061	0.2156	0.2252 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)					
Ground Floor			35.0400	0.1200	4.2048	84.0000	2943.3600 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	84.7200	13.8300	70.8900	0.2400	17.0136	42.2200	2992.9758 (29a)					
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)					
Total net area of external elements Aum(A, m2)			155.3200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5254		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			35.3600			18.0000	636.4800 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13421.7798 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.6503 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3054 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0305	Feb 29.0305	Mar 29.0305	Apr 29.0305	May 29.0305	Jun 29.0305	Jul 29.0305	Aug 29.0305	Sep 29.0305	Oct 29.0305	Nov 29.0305	Dec 29.0305 (38)
Heat transfer coeff	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359 (39)
Average = Sum(39)m / 12 =												80.3359 (39)
HLP	Jan 1.1411	Feb 1.1411	Mar 1.1411	Apr 1.1411	May 1.1411	Jun 1.1411	Jul 1.1411	Aug 1.1411	Sep 1.1411	Oct 1.1411	Nov 1.1411	Dec 1.1411 (40)
HLP (average)												1.1411 (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												2.2558 (42)
Average daily hot water use (litres/day)												87.7752 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Daily hot water use	96.5527	93.0417	89.5307	86.0197	82.5087	78.9977	78.9977	82.5087	86.0197	89.5307	93.0417	96.5527 (44)
Energy conte	143.1848	125.2304	129.2265	112.6628	108.1027	93.2844	86.4417	99.1931	100.3778	116.9806	127.6935	138.6669 (45)
Energy content (annual)												1381.0452 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4777	18.7846	19.3840	16.8994	16.2154	13.9927	12.9663	14.8790	15.0567	17.5471	19.1540	20.8000 (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	1.5899	1.3399	1.3305	1.1145	1.0257	0.8475	0.7853	0.9412	0.9930	1.2044	1.3663	1.5397 (61)
Total heat required for water heating calculated for each month	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066 (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												1.3132 (H8)
Utilisation factor												0.5330 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.7752 (H14)
Volume ratio Veff/V												0.8545 (H15)
Solar storage volume factor												0.9685 (H16)
Solar input												-823.2787 (H17)
Solar input	-23.8734	-39.8379	-67.8485	-90.9304	-112.3368	-110.4450	-108.9854	-95.2211	-74.5772	-50.9275	-28.3173	-19.9780 (63)
Solar input (sum of months) = Sum (63)m =												-823.2787 (63)
Output from w/h	120.9013	86.7324	62.7085	22.8469	0.0000	0.0000	0.0000	4.9132	26.7935	67.2576	100.7425	120.2286 (64)
Total per year (kWh/year) = Sum (64)m =												613.1245 (64)
Heat gains from water heating, kWh/month	48.0064	41.9741	43.3005	37.7390	36.2006	31.2289	28.9382	33.2170	33.6239	39.1972	42.7997	46.4917 (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	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.7716	40.6539	33.0620	25.0300	18.7102	15.7960	17.0681	22.1858	29.7777	37.8096	44.1294	47.0437	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.8639	298.9341	291.1974	274.7270	253.9360	234.3955	221.3412	218.2710	226.0077	242.4781	263.2691	282.8096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	(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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	(71)
Water heating gains (Table 5)	64.5248	62.4614	58.1995	52.4153	48.6567	43.3735	38.8954	44.6465	46.6998	52.6844	59.4440	62.4888	(72)
Total internal gains	505.0668	500.9559	481.3654	451.0788	420.2095	392.4714	376.2112	384.0098	401.3917	431.8786	465.7490	491.2486	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				3.1400	10.6334	0.6300	0.7000		0.7700		10.2041 (74)	
East				0.7200	19.6403	0.6300	0.7000		0.7700		4.3217 (76)	
South				7.8200	46.7521	0.6300	0.7000		0.7700		111.7325 (78)	
Solar gains	126.2582	210.9436	280.1543	336.9790	371.1138	366.4277	354.0511	328.3736	299.5288	230.6151	150.4177	108.6077 (83)
Total gains	631.3250	711.8995	761.5197	788.0579	791.3233	758.8992	730.2622	712.3834	700.9205	662.4937	616.1667	599.8563 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	
alpha	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	
util living area	0.9753	0.9590	0.9314	0.8779	0.7799	0.6260	0.4709	0.5011	0.7001	0.8845	0.9587	0.9796	(86)
MIT	19.8055	19.9951	20.2503	20.5389	20.7862	20.9357	20.9842	20.9793	20.8953	20.5894	20.1346	19.7461	(87)
Th 2	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	(88)
util rest of house	0.9695	0.9498	0.9156	0.8489	0.7278	0.5425	0.3664	0.3965	0.6225	0.8513	0.9477	0.9748	(89)
MIT 2	18.9034	19.0881	19.3344	19.6052	19.8222	19.9353	19.9625	19.9605	19.9097	19.6571	19.2273	18.8452	(90)
Living area fraction									fLA = Living area / (4) =			0.2605	(91)
MIT	19.1385	19.3244	19.5730	19.8484	20.0733	20.1959	20.2287	20.2259	20.1665	19.9000	19.4636	19.0799	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1385	19.3244	19.5730	19.8484	20.0733	20.1959	20.2287	20.2259	20.1665	19.9000	19.4636	19.0799	(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	0.9637	0.9427	0.9085	0.8452	0.7336	0.5620	0.3936	0.4235	0.6385	0.8488	0.9411	0.9695	(94)
Useful gains	608.4163	671.1327	691.8150	666.0390	580.5243	426.4685	287.3966	301.6868	447.5622	562.3191	579.8500	581.5490	(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	1192.0610	1158.8000	1050.2285	879.5537	672.6763	449.5538	291.5151	307.3611	487.3541	747.1216	993.2426	1195.3889	(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	434.2317	327.7124	266.6596	153.7306	68.5611	0.0000	0.0000	0.0000	0.0000	137.4930	297.6427	456.6969	(98)
Space heating												2142.7280	(98)
Space heating per m2												30.4365	(99)
												(98) / (4) =	

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2375.5299 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	434.2317	327.7124	266.6596	153.7306	68.5611	0.0000	0.0000	0.0000	0.0000	137.4930	297.6427	456.6969	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	481.4098	363.3175	295.6315	170.4330	76.0101	0.0000	0.0000	0.0000	0.0000	152.4313	329.9808	506.3159	(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	120.9013	86.7324	62.7085	22.8469	0.0000	0.0000	0.0000	4.9132	26.7935	67.2576	100.7425	120.2286	(64)
Efficiency of water heater (217)m	86.7296	86.8603	87.1515	88.1056	90.2000	76.2000	76.2000	76.2000	76.2000	85.0661	86.1953	76.2000	(216)
Fuel for water heating, kWh/month	139.4002	99.8528	71.9535	25.9313	0.0000	0.0000	0.0000	6.4477	35.1621	79.0651	116.8769	138.3945	(219)
Water heating fuel used												713.0842	(219)
Annual totals kWh/year													
Space heating fuel - main system												2375.5299	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													48.0815 (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													173.0815 (231)
Electricity for lighting (calculated in Appendix L)													323.3360 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1080 * 1.00) =										-690.8958		-690.8958	(233)
Total delivered energy for all uses												2894.1359	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2375.5299	3.4800	82.6684 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	713.0842	3.4800	24.8153 (247)
Mechanical ventilation fans	48.0815	13.1900	6.3420 (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	323.3360	13.1900	42.6480 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-690.8958	13.1900	-91.1292 (252)
Total energy cost			201.8321 (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] =	0.7346 (257)
SAP value		89.7527
SAP rating (Section 12)		90 (258)
SAP band		B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2375.5299	0.2160	513.1145 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	713.0842	0.2160	154.0262 (264)
Space and water heating			667.1406 (265)
Pumps and fans	173.0815	0.5190	89.8293 (267)
Energy for lighting	323.3360	0.5190	167.8114 (268)
Energy saving/generation technologies			
PV Unit	-690.8958	0.5190	-358.5749 (269)
Total kg/year			566.2065 (272)
CO2 emissions per m2			8.0400 (273)
EI value			93.4253
EI rating			93 (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	35.0400 (1b)	x 2.6800 (2b)	= 93.9072 (1b) - (3b)
First floor	35.3600 (1c)	x 2.3200 (2c)	= 82.0352 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.9424 (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												4.5100
Infiltration rate												0.2255 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1917 (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												
	0.2252	0.2108	0.2108	0.1917	0.1965	0.1869	0.1869	0.1821	0.1821	0.1965	0.1917	0.1965 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.1500	1.1000	2.3650		(26)					
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)					
Ground Floor			35.0400	0.1200	4.2048	84.0000	2943.3600 (28a)					
Above Entrance			0.2000	0.1600	0.0320	22.4400	4.4880 (28b)					
Brick and Block	84.7200	13.8300	70.8900	0.2400	17.0136	42.2200	2992.9758 (29a)					
Pitched Roof	35.3600		35.3600	0.1000	3.5360	9.1000	321.7760 (30)					
Total net area of external elements Aum(A, m2)			155.3200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5254		(33)					
Party Wall 1			44.0300	0.0000	0.0000	110.0000	4843.3000 (32)					
Ground Floor Stud			57.2900			9.0000	515.6100 (32c)					
First Floor Stud			59.2300			9.0000	533.0700 (32c)					
Internal Floor 1			35.3600			18.0000	636.4800 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13421.7798 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.6503 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3054 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0305	Feb 29.0305	Mar 29.0305	Apr 29.0305	May 29.0305	Jun 29.0305	Jul 29.0305	Aug 29.0305	Sep 29.0305	Oct 29.0305	Nov 29.0305	Dec 29.0305 (38)
Heat transfer coeff	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359	80.3359 (39)
Average = Sum(39)m / 12 =												80.3359 (39)
HLP	Jan 1.1411	Feb 1.1411	Mar 1.1411	Apr 1.1411	May 1.1411	Jun 1.1411	Jul 1.1411	Aug 1.1411	Sep 1.1411	Oct 1.1411	Nov 1.1411	Dec 1.1411 (40)
HLP (average)												1.1411 (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												2.2558 (42)
Average daily hot water use (litres/day)												87.7752 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Daily hot water use	96.5527	93.0417	89.5307	86.0197	82.5087	78.9977	78.9977	82.5087	86.0197	89.5307	93.0417	96.5527 (44)
Energy conte	143.1848	125.2304	129.2265	112.6628	108.1027	93.2844	86.4417	99.1931	100.3778	116.9806	127.6935	138.6669 (45)
Energy content (annual)												1381.0452 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4777	18.7846	19.3840	16.8994	16.2154	13.9927	12.9663	14.8790	15.0567	17.5471	19.1540	20.8000 (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	1.5899	1.3399	1.3305	1.1145	1.0257	0.8475	0.7853	0.9412	0.9930	1.2044	1.3663	1.5397 (61)
Total heat required for water heating calculated for each month	144.7747	126.5703	130.5571	113.7773	109.1284	94.1318	87.2270	100.1343	101.3707	118.1851	129.0598	140.2066 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.4671 (H8)
Utilisation factor												0.4942 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												87.7752 (H14)
Volume ratio Veff/V												0.8545 (H15)
Solar storage volume factor												0.9685 (H16)
Solar input												-852.7498 (H17)
Solar input	-27.8263	-39.5721	-68.6679	-92.3699	-107.3400	-116.7548	-110.7013	-100.9489	-79.0125	-54.6106	-32.9122	-22.0333 (63)
Solar input (sum of months) = Sum (63)m =												-852.7498 (63)
Output from w/h	116.9484	86.9982	61.8892	21.4075	1.7884	0.0000	0.0000	0.0000	22.3583	63.5745	96.1476	118.1733 (64)
Total per year (kWh/year) = Sum (64)m =												589.2852 (64)
Heat gains from water heating, kWh/month	48.0064	41.9741	43.3005	37.7390	36.2006	31.2289	28.9382	33.2170	33.6239	39.1972	42.7997	46.4917 (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	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	135.3478	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.7716	40.6539	33.0620	25.0300	18.7102	15.7960	17.0681	22.1858	29.7777	37.8096	44.1294	47.0437	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.8639	298.9341	291.1974	274.7270	253.9360	234.3955	221.3412	218.2710	226.0077	242.4781	263.2691	282.8096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	50.7906	(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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	(71)
Water heating gains (Table 5)	64.5248	62.4614	58.1995	52.4153	48.6567	43.3735	38.8954	44.6465	46.6998	52.6844	59.4440	62.4888	(72)
Total internal gains	505.0668	500.9559	481.3654	451.0788	420.2095	392.4714	376.2112	384.0098	401.3917	431.8786	465.7490	491.2486	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W	
North				3.1400	13.4684		0.6300	0.7000		0.7700	12.9246 (74)	
East				0.7200	25.1733		0.6300	0.7000		0.7700	5.5392 (76)	
South				7.8200	56.5862		0.6300	0.7000		0.7700	135.2350 (78)	
Solar gains	153.6988	218.3236	295.6288	359.4763	375.6113	412.0236	381.8283	366.8936	331.5802	257.5620	182.4311	125.2215 (83)
Total gains	658.7656	719.2796	776.9942	810.5552	795.8207	804.4951	758.0395	750.9035	732.9719	689.4407	648.1801	616.4702 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085	46.4085
alpha	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939	4.0939
util living area	0.9631	0.9475	0.9096	0.8334	0.7040	0.4930	0.3466	0.3395	0.5787	0.8180	0.9323	0.9695 (86)
MIT	20.0082	20.1385	20.3916	20.6707	20.8776	20.9784	20.9961	20.9965	20.9577	20.7515	20.3552	19.9609 (87)
Th 2	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674	19.9674 (88)
util rest of house	0.9542	0.9351	0.8884	0.7946	0.6371	0.4001	0.2398	0.2314	0.4854	0.7673	0.9136	0.9619 (89)
MIT 2	19.1024	19.2278	19.4684	19.7228	19.8939	19.9593	19.9667	19.9668	19.9491	19.7978	19.4391	19.0571 (90)
Living area fraction									fIA = Living area / (4) =			0.2605 (91)
MIT	19.3384	19.4650	19.7089	19.9698	20.1501	20.2248	20.2349	20.2351	20.2119	20.0463	19.6778	19.2925 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3384	19.4650	19.7089	19.9698	20.1501	20.2248	20.2349	20.2351	20.2119	20.0463	19.6778	19.2925 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9475	0.9279	0.8823	0.7947	0.6498	0.4239	0.2677	0.2597	0.5085	0.7716	0.9074	0.9557	(94)
Useful gains	624.1559	667.4537	685.5734	644.1782	517.0871	341.0018	202.9564	195.0361	372.7234	531.9728	588.1359	589.1420	(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	1103.6859	1081.7265	972.7807	792.8976	566.3796	347.4370	203.6429	195.6240	386.5650	638.3716	889.9422	1091.9699	(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	356.7703	278.3913	213.6822	107.0780	36.6737	0.0000	0.0000	0.0000	0.0000	79.1607	217.3005	374.1040	(98)
Space heating												1663.1607	(98)
Space heating per m2											(98) / (4) =	23.6244	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1843.8589 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	356.7703	278.3913	213.6822	107.0780	36.6737	0.0000	0.0000	0.0000	0.0000	79.1607	217.3005	374.1040	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	395.5325	308.6378	236.8983	118.7117	40.6582	0.0000	0.0000	0.0000	0.0000	87.7613	240.9096	414.7495	(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	116.9484	86.9982	61.8892	21.4075	1.7884	0.0000	0.0000	0.0000	22.3583	63.5745	96.1476	118.1733	(64)
Efficiency of water heater (217)m	86.2863	86.4196	86.6256	87.5209	89.4360	76.2000	76.2000	76.2000	76.2000	83.3771	85.3878	76.2000	(216)
Fuel for water heating, kWh/month	135.5353	100.6695	71.4445	24.4598	1.9996	0.0000	0.0000	0.0000	29.3416	76.2494	112.6011	136.7907	(219)
Water heating fuel used												689.0914	(219)
Annual totals kWh/year													
Space heating fuel - main system												1843.8589	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2240)													
mechanical ventilation fans (SFP = 0.2240)													48.0815 (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													173.0815 (231)
Electricity for lighting (calculated in Appendix L)													323.3360 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1206 * 1.00) =									-771.8465			-771.8465	(233)
Total delivered energy for all uses												2257.5213	(238)

10a. Fuel costs - using BEDF prices (548)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1843.8589	7.3800	136.0768 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	689.0914	7.3800	50.8549 (247)
Mechanical ventilation fans	48.0815	28.6600	13.7802 (249)
Pumps and fans for heating	75.0000	28.6600	21.4950 (249)
Pump for solar water heating	50.0000	28.6600	14.3300 (249)
Energy for lighting	323.3360	28.6600	92.6681 (250)
Additional standing charges			107.0000 (251)
Energy saving/generation technologies			
PV Unit	-771.8465	28.6600	-221.2112 (252)
Total energy cost			214.9938 (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	1843.8589	0.2160	398.2735 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	689.0914	0.2160	148.8437 (264)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space and water heating			547.1173 (265)
Pumps and fans	173.0815	0.5190	89.8293 (267)
Energy for lighting	323.3360	0.5190	167.8114 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	0.5190	-400.5884 (269)
Total kg/year			404.1696 (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	1843.8589	1.2200	2249.5079 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	689.0914	1.2200	840.6915 (264)
Space and water heating			3090.1994 (265)
Pumps and fans	173.0815	3.0700	531.3603 (267)
Energy for lighting	323.3360	3.0700	992.6416 (268)
Energy saving/generation technologies			
PV Unit	-771.8465	3.0700	-2369.5689 (269)
Primary energy kWh/year			2244.6324 (272)
Primary energy kWh/m2/year			31.8840 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 3	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	5, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.57	TER	18.88
Environmental	91 B	% DER<TER	33.41		
CO ₂ Emissions (t/year)	0.60	DFEE	45.02	TFEE	51.18
General Requirements Compliance	Pass	% DFEE<TFEE	12.04		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Mineral wool batt						
	Main construction	350	0.0380	9.2105	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Mineral wool batt						
	Main construction	100	0.0380	2.6316	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance: Upper limit = 11.772 m² K/W Lower limit = 11.430 m² K/W Average = 11.601 m² K/W
Total correction = 0.0096 m² K/W U-value (unrounded) = 0.1 W/m² K

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 3	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	5, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.57	TER	18.88
Environmental	91 B	% DER<TER	33.41		
CO ₂ Emissions (t/year)	0.60	DFEE	45.02	TFEE	51.18
General Requirements Compliance	Pass	% DFEE<TFEE	12.04		

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

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

Building Elements

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 3	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	5, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.57	TER	18.88
Environmental	91 B	% DER<TER	33.41		
CO ₂ Emissions (t/year)	0.60	DFEE	45.02	TFEE	51.18
General Requirements Compliance	Pass	% DFEE<TFEE	12.04		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene, 1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 3	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Project	5, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.57	TER	18.88
Environmental	91 B	% DER<TER	33.41		
CO ₂ Emissions (t/year)	0.60	DFEE	45.02	TFEE	51.18
General Requirements Compliance	Pass	% DFEE<TFEE	12.04		

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

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

Building Elements

Floor 000004

Floor Type: Exposed Floor

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	Plasterboard, high density						
	Main construction	12.5	0.2500	0.0500	100.00		
Layer 2	Mineral wool						
	Main construction	190	0.0400	4.7500	87.50		
	Main construction	190	0.1300	1.4615	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Mineral wool						
	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	Chipboard						
	Main construction	22	0.1300	0.1692	100.00	600	1700
Int surface				0.1700			

Total resistance:	Upper limit = 6.717 m ² K/W	Lower limit = 6.088 m ² K/W	Average = 6.402 m ² K/W
	Total correction = 0.0043 m ² K/W	U-value (unrounded) = 0.16 W/m ² K	

Unheated space: None

Total thickness: 325 mm

U-value: 0.16 W/m² K

Kappa: 22.44 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 3	Issued on Date	13/06/2024
Assessment Reference	As Built	Prop Type Ref	Type B Terrace
Property	5, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	12.57
Environmental	91 B	TER	18.88
CO ₂ Emissions (t/year)	0.60	% DER<TER	33.41
General Requirements Compliance	Pass	DfEE	45.02
		TFEE	51.18
		% DfEE<TFEE	12.04
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, End-Terrace
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	17.05 m	35.04 m ²	2.68 m
	1st Storey:	16.82 m	35.36 m ²	2.32 m

7.0 Living Area	18.34	m ²
-----------------	-------	----------------

8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	190.65	kJ/m ² K

9.0 External Walls			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Brick and Block	Cavity Wall	Other	0.24	42.22	84.72	70.89

9.1 Party Walls			U-Value	Kappa	Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	44.03

9.2 Internal Walls			Kappa	Area
Description	Construction		(kJ/m ² K)	(m ²)
Ground Floor Stud	Plasterboard on timber frame		9.00	57.29
First Floor Stud	Plasterboard on timber frame		9.00	59.23

10.0 External Roofs			U-Value	Kappa	Gross Area	Nett Area
Description	Type	Construction	(W/m ² K)	(kJ/m ² K)	(m ²)	(m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	35.36	35.36

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	35.04

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	35.04
Above Entrance	Exposed Floor - Timber	Other	0.16	22.44	0.20

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	35.36

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							2.15	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					3.14	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					0.72	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					7.82	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.69	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.75	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.74	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E3 Sill	7.16	0.021	No	Knauf P5
Independently assessed	E4 Jamb	24.60	0.016	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	17.05	0.320	No	
Table K1 - Default	E20 Exposed floor (normal)	1.01	0.320	No	
Table K1 - Default	E21 Exposed floor (inverted)	2.07	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	15.17	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.12	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.83	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	14.20	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.20	-0.091	No	Knauf P24
Independently assessed	E18 Party wall between dwellings	10.00	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	8.83	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.83	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.83	0.035	No	Knauf P29 Halved

Y-value 0.069 W/m²K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.51	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

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	13	
Total number of L.E.L. fittings	13	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17959	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	76.2	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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)
Combi boiler type	Standard Combi
Combi keep hot type	None
25.0 Main Heating 2	None

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901

29.0 Hot Water Cylinder	None
--------------------------------	------

32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.80	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£61	B 90	