



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 11, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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Report Issue Date: 13/06/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 6	Issued on Date	13/06/2024
Assessment Reference	AS Built	Prop Type Ref	Type B Terrace
Property	11, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	12.58
Environmental	91 B	TER	18.88
CO ₂ Emissions (t/year)	0.60	% DER<TER	33.39
General Requirements Compliance	Pass	DfEE	44.23
		TfEE	51.22
		% DfEE<TfEE	13.64
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)	12.58	kgCO ₂ /m ²	Pass
	-6.30 (-33.4%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	51.22	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	44.23	kWh/m ² /yr	
	-7.0 (-13.7%)	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	3.53 (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 South

7.82 m², No overhang

Windows facing West

0.72 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Air permeability	3.5	m ³ /m ² h
Photovoltaic array	0.80	kW

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THERMAL BRIDGING

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SAP Rating	88 B	DER	12.58
Environmental	91 B	TER	18.88
CO ₂ Emissions (t/year)	0.60	% DER<TER	33.39
General Requirements Compliance	Pass	DFEE	44.23
		TFEE	51.22
		% DFEE<TFEE	13.64
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	15.81	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

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Environmental	91 B	% DER<TER	33.39		
CO ₂ Emissions (t/year)	0.60	DFEE	44.23	TFEE	51.22
General Requirements Compliance	Pass	% DFEE<TFEE	13.64		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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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) 12.58 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.2 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: 3.53 (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 South: 7.82 m², No overhang
Windows facing West: 0.72 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Air permeability 3.5 m³/m²h
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 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.5300
Infiltration rate					0.1765 (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) =		0.1500 (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	0.1913	0.1875	0.1838	0.1650	0.1613	0.1425	0.1425	0.1388	0.1500	0.1613	0.1688	0.1763 (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			35.3600	0.1200	4.2432	84.0000	2970.2400 (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)			155.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5638		(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			59.2400			9.0000	533.1600 (32c)					
Internal Floor 1			35.0400			18.0000	630.7200 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13442.9898 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.9516 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3438 (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	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743 (39)
Average = Sum(39)m / 12 =												80.3743 (39)
HLP	Jan 1.1417	Feb 1.1417	Mar 1.1417	Apr 1.1417	May 1.1417	Jun 1.1417	Jul 1.1417	Aug 1.1417	Sep 1.1417	Oct 1.1417	Nov 1.1417	Dec 1.1417 (40)
HLP (average)												1.1417 (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	Specific data or Table 6b	Specific data FF or Table 6c		Access factor Table 6d	Gains W		
North				3.1400	10.6334	0.6300	0.7000		0.7700	10.2041 (74)		
South				7.8200	46.7521	0.6300	0.7000		0.7700	111.7325 (78)		
West				0.7200	19.6403	0.6300	0.7000		0.7700	4.3217 (80)		
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	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597
alpha	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973
util living area	0.9913	0.9825	0.9658	0.9291	0.8518	0.7129	0.5535	0.5903	0.7931	0.9404	0.9839	0.9932 (86)
MIT	19.5552	19.7612	20.0474	20.3840	20.6917	20.8963	20.9718	20.9628	20.8307	20.4311	19.9138	19.4979 (87)
Th 2	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669 (88)
util rest of house	0.9891	0.9781	0.9568	0.9092	0.8082	0.6289	0.4360	0.4741	0.7217	0.9197	0.9790	0.9915 (89)
MIT 2	18.6569	18.8606	19.1418	19.4664	19.7479	19.9123	19.9578	19.9539	19.8673	19.5167	19.0135	18.6000 (90)
Living area fraction									fLA = Living area / (4) =			0.2605 (91)
MIT	18.8909	19.0952	19.3777	19.7054	19.9938	20.1686	20.2220	20.2167	20.1183	19.7549	19.2481	18.8339 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8909	19.0952	19.3777	19.7054	19.9938	20.1686	20.2220	20.2167	20.1183	19.7549	19.2481	18.8339 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9860	0.9733	0.9504	0.9032	0.8095	0.6467	0.4664	0.5037	0.7334	0.9144	0.9746	0.9889 (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	1172.7374	1140.9284	1035.0380	868.4808	666.6054	447.5751	291.1148	306.7659	483.7185	735.8188	976.3922	1176.1919 (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	529.8104	407.0977	341.1988	206.9422	100.1415	0.0000	0.0000	0.0000	0.0000	193.1869	377.5974	551.9392 (98)
Space heating												2707.9141 (98)
Space heating per m2										(98) / (4) =		38.4647 (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													3002.1221 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	529.8104	407.0977	341.1988	206.9422	100.1415	0.0000	0.0000	0.0000	0.0000	193.1869	377.5974	551.9392	(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)	587.3730	451.3278	378.2692	229.4260	111.0216	0.0000	0.0000	0.0000	0.0000	214.1762	418.6223	611.9060	(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	86.7783	86.4337	85.8356	84.6807	82.3137	76.2000	76.2000	76.2000	76.2000	84.3199	86.1673	76.2000	(216)
Fuel for water heating, kWh/month	166.8328	146.4363	152.1013	134.3605	132.5763	123.5326	114.4711	131.4098	133.0325	140.1628	149.7781	161.2247	(219)
Water heating fuel used												1685.9188	(219)
Annual totals kWh/year													
Space heating fuel - main system												3002.1221	(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 (233)
Total delivered energy for all uses													4443.5627 (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	3002.1221	0.2160	648.4584 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1685.9188	0.2160	364.1585 (264)
Space and water heating			1012.6168 (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			885.7326 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5800 (273)

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

DER			12.5800 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			31.7249 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			31.7249 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			35.3600	0.1300	4.5968			(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)			155.6400					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.6146		(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) =	49.6877	(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	84.7475	84.5134	84.2839	83.2060	83.0043	82.0655	82.0655	81.8917	82.4271	83.0043	83.4123	83.8389	(39)
Average = Sum(39)m / 12 =												83.2051	(39)
HLP	Jan 1.2038	Feb 1.2005	Mar 1.1972	Apr 1.1819	May 1.1790	Jun 1.1657	Jul 1.1657	Aug 1.1632	Sep 1.1708	Oct 1.1790	Nov 1.1848	Dec 1.1909	(40)
HLP (average)												1.1819	(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)		
South				7.8200	46.7521	0.6300	0.7000	0.7700		111.7325 (78)		
West				0.7200	19.6403	0.6300	0.7000	0.7700		4.3217 (80)		
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	57.6877	57.8475	58.0050	58.7564	58.8992	59.5730	59.5730	59.6995	59.3116	58.8992	58.6111	58.3129
alpha	4.8458	4.8565	4.8670	4.9171	4.9266	4.9715	4.9715	4.9800	4.9541	4.9266	4.9074	4.8875
util living area	0.9964	0.9917	0.9814	0.9535	0.8838	0.7363	0.5642	0.6018	0.8210	0.9616	0.9923	0.9973 (86)
MIT	19.7663	19.9424	20.1901	20.4964	20.7626	20.9343	20.9859	20.9806	20.8811	20.5380	20.0934	19.7361 (87)
Th 2	19.9170	19.9196	19.9222	19.9345	19.9368	19.9475	19.9475	19.9495	19.9434	19.9368	19.9322	19.9273 (88)
util rest of house	0.9952	0.9890	0.9748	0.9361	0.8390	0.6438	0.4380	0.4763	0.7434	0.9436	0.9892	0.9964 (89)
MIT 2	18.2865	18.5443	18.9042	19.3469	19.7021	19.9031	19.9423	19.9416	19.8506	19.4129	18.7743	18.2498 (90)
Living area fraction	18.6720	18.9085	19.2392	19.6464	19.9784	20.1717	20.2142	20.2123	20.1191	19.7060	19.1180	18.6370 (92)
Temperature adjustment	18.6720	18.9085	19.2392	19.6464	19.9784	20.1717	20.2142	20.2123	20.1191	19.7060	19.1180	18.6370 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	479.8394	556.9677	602.3533	611.8019	564.3125	429.8220	292.6237	306.3592	442.5058	502.7679	472.4264	452.8550 (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	1217.9882	1183.9074	1073.7099	894.1615	687.1424	457.2448	296.6001	312.1945	496.1347	755.8384	1002.4452	1210.3784 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	549.1827	421.3035	350.6893	203.2989	91.3855	0.0000	0.0000	0.0000	0.0000	188.2844	381.6136	563.5974 (98)
Space heating												2749.3553 (98)
Space heating per m2												39.0533 (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													2943.6352 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	549.1827	421.3035	350.6893	203.2989	91.3855	0.0000	0.0000	0.0000	0.0000	188.2844	381.6136	563.5974	(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)	587.9901	451.0744	375.4704	217.6648	97.8431	0.0000	0.0000	0.0000	0.0000	201.5893	408.5799	603.4234	(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	87.5434	87.2700	86.7690	85.7337	83.8443	80.3000	80.3000	80.3000	80.3000	85.4211	86.9796	87.6440	(217)
Fuel for water heating, kWh/month	219.7620	192.5691	201.5126	180.8898	179.0798	164.6851	157.7809	175.8887	177.8312	190.3564	199.5606	214.3547	(219)
Water heating fuel used												2254.2708	(219)
Annual totals kWh/year													
Space heating fuel - main system												2943.6352	(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												5596.2420	(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	2943.6352	0.2160	635.8252 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2254.2708	0.2160	486.9225 (264)
Space and water heating			1122.7477 (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			1329.4841 (272)
Emissions per m2 for space and water heating			15.9481 (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) = (15.9481 * 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					3.5300
Infiltration rate					0.3470 (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) =	0.2950 (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	0.3761	0.3687	0.3613	0.3245	0.3171	0.2802	0.2802	0.2728	0.2950	0.3171	0.3318	0.3466 (22b)
Effective ac	0.5707	0.5680	0.5653	0.5526	0.5503	0.5393	0.5393	0.5372	0.5435	0.5503	0.5551	0.5601 (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			35.3600	0.1200	4.2432	84.0000	2970.2400 (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)			155.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5638		(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			59.2400			9.0000	533.1600 (32c)
Internal Floor 1			35.0400			18.0000	630.7200 (32d)
Internal Ceiling 1			35.0400			9.0000	315.3600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 13127.6298 (34)
186.4720 (35)
10.7800 (36)
(33) + (36) = 51.3438 (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	33.1363	32.9769	32.8206	32.0866	31.9492	31.3099	31.3099	31.1915	31.5562	31.9492	32.2271	32.5175 (38)
Heat transfer coeff	84.4801	84.3207	84.1644	83.4304	83.2931	82.6538	82.6538	82.5354	82.9000	83.2931	83.5709	83.8613 (39)
Average = Sum(39)m / 12 =												83.4297 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2000	1.1977	1.1955	1.1851	1.1831	1.1741	1.1741	1.1724	1.1776	1.1831	1.1871	1.1912 (40)
HLP (average)												1.1851 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
2.2558 (42)
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)

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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)		
South				7.8200	46.7521	0.6300	0.7000	0.7700		111.7325 (78)		
West				0.7200	19.6403	0.6300	0.7000	0.7700		4.3217 (80)		

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	43.1647	43.2464	43.3267	43.7079	43.7799	44.1185	44.1185	44.1818	43.9875	43.7799	43.6344	43.4832	
alpha	3.8776	3.8831	3.8884	3.9139	3.9187	3.9412	3.9412	3.9455	3.9325	3.9187	3.9090	3.8989	
util living area	0.9924	0.9846	0.9698	0.9367	0.8667	0.7342	0.5772	0.6155	0.8131	0.9479	0.9860	0.9941	(86)
MIT	19.3930	19.6100	19.9165	20.2917	20.6305	20.8704	20.9623	20.9508	20.7920	20.3476	19.7936	19.3495	(87)
Th 2	19.9200	19.9218	19.9236	19.9319	19.9335	19.9408	19.9408	19.9422	19.9380	19.9335	19.9303	19.9270	(88)
util rest of house	0.9905	0.9807	0.9617	0.9184	0.8253	0.6504	0.4547	0.4953	0.7439	0.9292	0.9818	0.9925	(89)
MIT 2	18.4621	18.6786	18.9820	19.3524	19.6675	19.8711	19.9283	19.9244	19.8131	19.4128	18.8688	18.4243	(90)
Living area fraction	18.7046	18.9212	19.2255	19.5971	19.9184	20.1314	20.1977	20.1918	20.0681	19.6563	19.1097	18.6653	(92)
MIT	18.7046	18.9212	19.2255	19.5971	19.9184	20.1314	20.1977	20.1918	20.0681	19.6563	19.1097	18.6653	(93)
Temperature adjustment	18.7046	18.9212	19.2255	19.5971	19.9184	20.1314	20.1977	20.1918	20.0681	19.6563	19.1097	18.6653	(93)
adjusted MIT	18.7046	18.9212	19.2255	19.5971	19.9184	20.1314	20.1977	20.1918	20.0681	19.6563	19.1097	18.6653	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	435.0243	511.3165	556.0601	566.1687	524.8355	409.6136	287.1443	298.8858	413.9639	460.1127	429.0674	409.2332	(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	1216.9052	1182.2796	1071.0325	892.4639	684.5350	457.1920	297.3616	312.9562	494.7549	754.3281	1003.6627	1213.0812	(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	581.7194	450.8872	383.1394	234.9326	118.8164	0.0000	0.0000	0.0000	0.0000	218.8963	413.7086	598.0629	(98)
Space heating												3000.1629	(98)
Space heating per m2												42.6159	(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	776.9454	611.6378	627.2688	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8100	0.8789	0.8616	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	629.3573	537.5852	540.4353	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	124.2465	175.0229	154.8061	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												454.0755 (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	31.0616	43.7557	38.7015	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												113.5189 (107)
Space cooling per m2												1.6125 (108)
Energy for space heating												42.6159 (99)
Energy for space cooling												1.6125 (108)
Total												44.2284 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.2 (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			35.3600	0.1300	4.5968			(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)			155.6400					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.6146		(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) =	49.6877	(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	84.7475	84.5134	84.2839	83.2060	83.0043	82.0655	82.0655	81.8917	82.4271	83.0043	83.4123	83.8389	(39)
Average = Sum(39)m / 12 =												83.2051	(39)
HLP	Jan 1.2038	Feb 1.2005	Mar 1.1972	Apr 1.1819	May 1.1790	Jun 1.1657	Jul 1.1657	Aug 1.1632	Sep 1.1708	Oct 1.1790	Nov 1.1848	Dec 1.1909	(40)
HLP (average)												1.1819	(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												
Water 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 (46)
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)	
South					7.8200	46.7521		0.6300	0.7000	0.7700		111.7325 (78)	
West					0.7200	19.6403		0.6300	0.7000	0.7700		4.3217 (80)	

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	57.6877	57.8475	58.0050	58.7564	58.8992	59.5730	59.5730	59.6995	59.3116	58.8992	58.6111	58.3129	
alpha	4.8458	4.8565	4.8670	4.9171	4.9266	4.9715	4.9715	4.9800	4.9541	4.9266	4.9074	4.8875	
util living area	0.9976	0.9940	0.9856	0.9622	0.9005	0.7615	0.5896	0.6310	0.8462	0.9706	0.9947	0.9982	(86)
MIT	19.7109	19.8898	20.1426	20.4574	20.7361	20.9234	20.9829	20.9762	20.8619	20.4965	20.0419	19.6813	(87)
Th 2	19.9170	19.9196	19.9222	19.9345	19.9368	19.9475	19.9475	19.9495	19.9434	19.9368	19.9322	19.9273	(88)
util rest of house	0.9968	0.9920	0.9805	0.9474	0.8596	0.6702	0.4595	0.5022	0.7731	0.9562	0.9925	0.9976	(89)
MIT 2	18.7486	18.9287	19.1810	19.4973	19.7555	19.9113	19.9431	19.9427	19.8677	19.5409	19.0908	18.7273	(90)
Living area fraction									fLA = Living area / (4) =			0.2605	(91)
MIT	18.9993	19.1791	19.4315	19.7474	20.0110	20.1750	20.2140	20.2120	20.1267	19.7898	19.3386	18.9759	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9993	19.1791	19.4315	19.7474	20.0110	20.1750	20.2140	20.2120	20.1267	19.7898	19.3386	18.9759	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	438.6761	518.7344	569.0718	586.5125	549.1982	424.8976	291.7013	304.8606	432.6644	475.3608	434.9785	412.0594	(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	(95)
Heat loss rate W	1245.7275	1206.7722	1089.9161	902.5694	689.8475	457.5148	296.5865	312.1670	496.7612	762.7951	1020.8494	1238.7911	(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	600.4462	462.3614	387.5082	227.5609	104.6430	0.0000	0.0000	0.0000	0.0000	213.8511	421.8271	615.0883	(98)
Space heating												3033.2862	(98)
Space heating per m2										(98) / (4) =		43.0865	(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	771.4160	607.2849	622.3767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8483	0.9153	0.8994	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	654.3607	555.8513	559.7731	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	106.2441	161.4329	140.4187	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												408.0957 (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	26.5610	40.3582	35.1047	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												102.0239 (107)
Space cooling per m2												1.4492 (108)
Energy for space heating												43.0865 (99)
Energy for space cooling												1.4492 (108)
Total												44.5357 (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											3.5300	
Infiltration rate											0.1765 (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) =	0.1500 (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												
	0.1763	0.1650	0.1650	0.1500	0.1538	0.1463	0.1463	0.1425	0.1425	0.1538	0.1500	0.1538 (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			35.3600	0.1200	4.2432	84.0000	2970.2400 (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)			155.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5638		(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			59.2400			9.0000	533.1600 (32c)					
Internal Floor 1			35.0400			18.0000	630.7200 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13442.9898 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.9516 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3438 (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	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743 (39)
Average = Sum(39)m / 12 =												80.3743 (39)
HLP	Jan 1.1417	Feb 1.1417	Mar 1.1417	Apr 1.1417	May 1.1417	Jun 1.1417	Jul 1.1417	Aug 1.1417	Sep 1.1417	Oct 1.1417	Nov 1.1417	Dec 1.1417 (40)
HLP (average)												1.1417 (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 m2	Solar flux Table 6a W/m2	Specific data or Table 6b	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)
South	7.8200	56.5862	0.6300	0.7000	0.7700	135.2350 (78)
West	0.7200	25.1733	0.6300	0.7000	0.7700	5.5392 (80)

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	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597 (86)
alpha	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973 (86)
util living area	0.9632	0.9476	0.9098	0.8337	0.7043	0.4932	0.3468	0.3397	0.5790	0.8183	0.9325	0.9697 (86)
MIT	20.0087	20.1389	20.3918	20.6709	20.8777	20.9785	20.9961	20.9965	20.9578	20.7516	20.3554	19.9614 (87)
Th 2	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669 (88)
util rest of house	0.9543	0.9353	0.8887	0.7949	0.6374	0.4002	0.2398	0.2315	0.4856	0.7676	0.9138	0.9620 (89)
MIT 2	19.1024	19.2277	19.4682	19.7226	19.8935	19.9589	19.9663	19.9664	19.9487	19.7975	19.4389	19.0571 (90)
Living area fraction	19.3385	19.4651	19.7088	19.9696	20.1499	20.2245	20.2346	20.2348	20.2116	20.0461	19.6777	0.2605 (91)
MIT	19.3385	19.4651	19.7088	19.9696	20.1499	20.2245	20.2346	20.2348	20.2116	20.0461	19.6777	19.2927 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3385	19.4651	19.7088	19.9696	20.1499	20.2245	20.2346	20.2348	20.2116	20.0461	19.6777	19.2927 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	624.2720	667.6067	685.7839	644.4369	517.3267	341.1507	203.0298	195.1055	372.8924	532.1934	588.2928	589.2395 (94)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Heat loss rate W	1104.2231	1082.2468	973.2396	793.2632	566.6313	347.5789	203.7144	195.6917	386.7268	638.6607	890.3628	1092.5045 (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	357.0836	278.6382	213.8670	107.1550	36.6827	0.0000	0.0000	0.0000	0.0000	79.2117	217.4904	374.4292 (98)
Space heating												1664.5578 (98)
RHI space heating demand												1665 (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												3.5300
Infiltration rate												0.1765 (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) =	0.1500 (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												
	0.1913	0.1875	0.1838	0.1650	0.1613	0.1425	0.1425	0.1388	0.1500	0.1613	0.1688	0.1763 (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			35.3600	0.1200	4.2432	84.0000	2970.2400 (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)			155.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5638		(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			59.2400			9.0000	533.1600 (32c)					
Internal Floor 1			35.0400			18.0000	630.7200 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13442.9898 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.9516 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3438 (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	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743 (39)
Average = Sum(39)m / 12 =												80.3743 (39)
HLP	Jan 1.1417	Feb 1.1417	Mar 1.1417	Apr 1.1417	May 1.1417	Jun 1.1417	Jul 1.1417	Aug 1.1417	Sep 1.1417	Oct 1.1417	Nov 1.1417	Dec 1.1417 (40)
HLP (average)												1.1417 (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)
Total per year (kWh/year) = Sum(64)m = 1395.1231 (64)												
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												

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)		
South					7.8200	46.7521	0.6300	0.7000	0.7700	111.7325 (78)		
West					0.7200	19.6403	0.6300	0.7000	0.7700	4.3217 (80)		
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	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597
alpha	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973
util living area	0.9754	0.9592	0.9316	0.8782	0.7803	0.6263	0.4711	0.5014	0.7004	0.8847	0.9589	0.9797 (86)
MIT	19.8061	19.9956	20.2506	20.5391	20.7863	20.9358	20.9842	20.9794	20.8954	20.5896	20.1349	19.7467 (87)
Th 2	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669 (88)
util rest of house	0.9696	0.9499	0.9158	0.8492	0.7281	0.5427	0.3666	0.3966	0.6227	0.8516	0.9478	0.9749 (89)
MIT 2	18.9036	19.0881	19.3342	19.6050	19.8218	19.9349	19.9621	19.9601	19.9093	19.6568	19.2272	18.8454 (90)
Living area fraction									fLA = Living area / (4) =			0.2605 (91)
MIT	19.1387	19.3245	19.5729	19.8483	20.0731	20.1957	20.2284	20.2256	20.1662	19.8998	19.4637	19.0802 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1387	19.3245	19.5729	19.8483	20.0731	20.1957	20.2284	20.2256	20.1662	19.8998	19.4637	19.0802 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9639	0.9429	0.9087	0.8455	0.7339	0.5622	0.3937	0.4237	0.6388	0.8491	0.9412	0.9696 (94)
Ext temp.	608.5038	671.2652	691.9989	666.2748	580.7787	426.6661	287.5170	301.8158	447.7682	562.5148	579.9664	581.6228 (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	1192.6511	1159.3634	1050.7292	879.9639	672.9815	449.7470	291.6296	307.4836	487.5670	747.4665	993.7218	1195.9846 (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	434.6055	328.0020	266.8953	153.8561	68.5989	0.0000	0.0000	0.0000	0.0000	137.6041	297.9039	457.0852 (98)
Space heating per m2												2144.5511 (98)
										(98) / (4) =		30.4624 (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													2377.5511 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	434.6055	328.0020	266.8953	153.8561	68.5989	0.0000	0.0000	0.0000	0.0000	137.6041	297.9039	457.0852	(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)	481.8243	363.6386	295.8928	170.5722	76.0520	0.0000	0.0000	0.0000	0.0000	152.5544	330.2704	506.7463	(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	86.2407	85.8102	85.0661	83.6652	81.0559	76.2000	76.2000	76.2000	76.2000	83.1421	85.4542	76.2000	(216)
Fuel for water heating, kWh/month	167.8728	147.5003	153.4771	135.9912	134.6335	123.5326	114.4711	131.4098	133.0325	142.1483	151.0280	162.1434	(219)
Water heating fuel used												1697.2406	(219)
Annual totals kWh/year													
Space heating fuel - main system												2377.5511	(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													3830.3134 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2377.5511	3.4800	82.7388 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1697.2406	3.4800	59.0640 (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			229.5561 (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		0.8355 (257)
SAP rating (Section 12)		88.3452
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	2377.5511	0.2160	513.5510 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1697.2406	0.2160	366.6040 (264)
Space and water heating			880.1550 (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			753.2708 (272)
CO2 emissions per m2			10.7000 (273)
EI value			91.2532
EI rating			91 (274)

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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) =											Air changes per hour		
Pressure test											0.0000 / (5) =		0.0000 (8)
Measured/design AP50											Yes		
Infiltration rate											3.5300		
Number of sides sheltered											0.1765 (18)		
											2 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.1500 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)	
Adj infilt rate	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)	
	0.1763	0.1650	0.1650	0.1500	0.1538	0.1463	0.1463	0.1425	0.1425	0.1538	0.1500	0.1538 (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			35.3600	0.1200	4.2432	84.0000	2970.2400 (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)			155.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5638		(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			59.2400			9.0000	533.1600 (32c)					
Internal Floor 1			35.0400			18.0000	630.7200 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13442.9898 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.9516 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3438 (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	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743 (39)
Average = Sum(39)m / 12 =												80.3743 (39)
HLP	Jan 1.1417	Feb 1.1417	Mar 1.1417	Apr 1.1417	May 1.1417	Jun 1.1417	Jul 1.1417	Aug 1.1417	Sep 1.1417	Oct 1.1417	Nov 1.1417	Dec 1.1417 (40)
HLP (average)												1.1417 (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)
Total per year (kWh/year) = Sum(64)m = 1395.1231 (64)												
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												

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)		
South				7.8200	56.5862	0.6300	0.7000		0.7700	135.2350 (78)		
West				0.7200	25.1733	0.6300	0.7000		0.7700	5.5392 (80)		
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	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597
alpha	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973
util living area	0.9632	0.9476	0.9098	0.8337	0.7043	0.4932	0.3468	0.3397	0.5790	0.8183	0.9325	0.9697 (86)
MIT	20.0087	20.1389	20.3918	20.6709	20.8777	20.9785	20.9961	20.9965	20.9578	20.7516	20.3554	19.9614 (87)
Th 2	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669 (88)
util rest of house	0.9543	0.9353	0.8887	0.7949	0.6374	0.4002	0.2398	0.2315	0.4856	0.7676	0.9138	0.9620 (89)
MIT 2	19.1024	19.2277	19.4682	19.7226	19.8935	19.9589	19.9663	19.9664	19.9487	19.7975	19.4389	19.0571 (90)
Living area fraction	19.3385	19.4651	19.7088	19.9696	20.1499	20.2245	20.2346	20.2348	20.2116	20.0461	19.6777	19.2927 (92)
MIT	19.3385	19.4651	19.7088	19.9696	20.1499	20.2245	20.2346	20.2348	20.2116	20.0461	19.6777	19.2927 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3385	19.4651	19.7088	19.9696	20.1499	20.2245	20.2346	20.2348	20.2116	20.0461	19.6777	19.2927 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9476	0.9282	0.8826	0.7951	0.6501	0.4241	0.2678	0.2598	0.5087	0.7719	0.9076	0.9558 (94)
Ext temp.	624.2720	667.6067	685.7839	644.4369	517.3267	341.1507	203.0298	195.1055	372.8924	532.1934	588.2928	589.2395 (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	1104.2231	1082.2468	973.2396	793.2632	566.6313	347.5789	203.7144	195.6917	386.7268	638.6607	890.3628	1092.5045 (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	357.0836	278.6382	213.8670	107.1550	36.6827	0.0000	0.0000	0.0000	0.0000	79.2117	217.4904	374.4292 (98)
Space heating per m2												1664.5578 (98)
(98) / (4) =												23.6443 (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													1845.4077 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	357.0836	278.6382	213.8670	107.1550	36.6827	0.0000	0.0000	0.0000	0.0000	79.2117	217.4904	374.4292	(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)	395.8799	308.9115	237.1031	118.7971	40.6681	0.0000	0.0000	0.0000	0.0000	87.8178	241.1202	415.1100	(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	85.6599	85.3045	84.3272	82.4032	79.2963	76.2000	76.2000	76.2000	76.2000	81.2612	84.4235	76.2000	(216)
Fuel for water heating, kWh/month	169.0110	148.3748	154.8221	138.0738	137.6210	123.5326	114.4711	131.4098	133.0325	145.4385	152.8718	163.2201	(219)
Water heating fuel used												1711.8791	(219)
Annual totals kWh/year													
Space heating fuel - main system												1845.4077	(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 (233)
Total delivered energy for all uses													3231.8578 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1845.4077	7.3800	136.1911	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1711.8791	7.3800	126.3367	(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			276.2598	(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	1845.4077	0.2160	398.6081	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1711.8791	0.2160	369.7659	(264)
Space and water heating			768.3740	(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			599.4763	(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	1845.4077	1.2200	2251.3974	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1711.8791	1.2200	2088.4925	(264)
Space and water heating			4339.8899	(265)
Pumps and fans	123.0815	3.0700	377.8603	(267)
Energy for lighting	323.3360	3.0700	992.6416	(268)

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Energy saving/generation technologies
PV Unit -771.8465 3.0700 -2369.5689 (269)
Primary energy kWh/year 3340.8229 (272)
Primary energy kWh/m2/year 47.4549 (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	£370	£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	£277	£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												3.5300
Infiltration rate												0.1765 (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) =	0.1500 (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												
	0.1913	0.1875	0.1838	0.1650	0.1613	0.1425	0.1425	0.1388	0.1500	0.1613	0.1688	0.1763 (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			35.3600	0.1200	4.2432	84.0000	2970.2400 (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)			155.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5638		(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			59.2400			9.0000	533.1600 (32c)					
Internal Floor 1			35.0400			18.0000	630.7200 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13442.9898 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.9516 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3438 (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	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743 (39)
Average = Sum(39)m / 12 =												80.3743 (39)
HLP	Jan 1.1417	Feb 1.1417	Mar 1.1417	Apr 1.1417	May 1.1417	Jun 1.1417	Jul 1.1417	Aug 1.1417	Sep 1.1417	Oct 1.1417	Nov 1.1417	Dec 1.1417 (40)
HLP (average)												1.1417 (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)	
South				7.8200	46.7521	0.6300	0.7000		0.7700		111.7325 (78)	
West				0.7200	19.6403	0.6300	0.7000		0.7700		4.3217 (80)	
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	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	
alpha	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	
util living area	0.9754	0.9592	0.9316	0.8782	0.7803	0.6263	0.4711	0.5014	0.7004	0.8847	0.9589	0.9797	(86)
MIT	19.8061	19.9956	20.2506	20.5391	20.7863	20.9358	20.9842	20.9794	20.8954	20.5896	20.1349	19.7467	(87)
Th 2	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	(88)
util rest of house	0.9696	0.9499	0.9158	0.8492	0.7281	0.5427	0.3666	0.3966	0.6227	0.8516	0.9478	0.9749	(89)
MIT 2	18.9036	19.0881	19.3342	19.6050	19.8218	19.9349	19.9621	19.9601	19.9093	19.6568	19.2272	18.8454	(90)
Living area fraction									fLA = Living area / (4) =			0.2605	(91)
MIT	19.1387	19.3245	19.5729	19.8483	20.0731	20.1957	20.2284	20.2256	20.1662	19.8998	19.4637	19.0802	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1387	19.3245	19.5729	19.8483	20.0731	20.1957	20.2284	20.2256	20.1662	19.8998	19.4637	19.0802	(93)

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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	0.9639	0.9429	0.9087	0.8455	0.7339	0.5622	0.3937	0.4237	0.6388	0.8491	0.9412	0.9696	(94)
Useful gains	608.5038	671.2652	691.9989	666.2748	580.7787	426.6661	287.5170	301.8158	447.7682	562.5148	579.9664	581.6228	(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	1192.6511	1159.3634	1050.7292	879.9639	672.9815	449.7470	291.6296	307.4836	487.5670	747.4665	993.7218	1195.9846	(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	434.6055	328.0020	266.8953	153.8561	68.5989	0.0000	0.0000	0.0000	0.0000	137.6041	297.9039	457.0852	(98)
Space heating												2144.5511	(98)
Space heating per m2												30.4624	(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													2377.5511 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	434.6055	328.0020	266.8953	153.8561	68.5989	0.0000	0.0000	0.0000	0.0000	137.6041	297.9039	457.0852	(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)	481.8243	363.6386	295.8928	170.5722	76.0520	0.0000	0.0000	0.0000	0.0000	152.5544	330.2704	506.7463	(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	86.7319	86.8625	87.1536	88.1070	90.2000	76.2000	76.2000	76.2000	76.2000	85.0687	86.1978	76.2000	(216)
Fuel for water heating, kWh/month	139.3966	99.8502	71.9518	25.9309	0.0000	0.0000	0.0000	6.4477	35.1621	79.0626	116.8735	138.3911	(219)
Water heating fuel used												713.0665	(219)
Annual totals kWh/year													
Space heating fuel - main system												2377.5511	(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												2896.1394	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2377.5511	3.4800	82.7388 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	713.0665	3.4800	24.8147 (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			201.9018 (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] =	0.7348 (257)
SAP value		89.7492
SAP rating (Section 12)		90 (258)
SAP band		B

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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	2377.5511	0.2160	513.5510 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	713.0665	0.2160	154.0224 (264)
Space and water heating			667.5734 (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			566.6392 (272)
CO2 emissions per m2			8.0500 (273)
EI value			93.4203
EI rating			93 (274)
EI band			A

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Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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												3.5300	
Infiltration rate												0.1765 (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) =			0.1500 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)	
Adj infilt rate	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)	
	0.1763	0.1650	0.1650	0.1500	0.1538	0.1463	0.1463	0.1425	0.1425	0.1538	0.1500	0.1538 (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			35.3600	0.1200	4.2432	84.0000	2970.2400 (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)			155.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5638		(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			59.2400			9.0000	533.1600 (32c)					
Internal Floor 1			35.0400			18.0000	630.7200 (32d)					
Internal Ceiling 1			35.0400			18.0000	630.7200 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13442.9898 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.9516 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7800 (36)					
Total fabric heat loss						(33) + (36) =	51.3438 (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	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743	80.3743 (39)
Average = Sum(39)m / 12 =												80.3743 (39)
HLP	Jan 1.1417	Feb 1.1417	Mar 1.1417	Apr 1.1417	May 1.1417	Jun 1.1417	Jul 1.1417	Aug 1.1417	Sep 1.1417	Oct 1.1417	Nov 1.1417	Dec 1.1417 (40)
HLP (average)												1.1417 (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)	
South				7.8200	56.5862		0.6300	0.7000		0.7700	135.2350 (78)	
West				0.7200	25.1733		0.6300	0.7000		0.7700	5.5392 (80)	
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	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597	46.4597
alpha	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973	4.0973
util living area	0.9632	0.9476	0.9098	0.8337	0.7043	0.4932	0.3468	0.3397	0.5790	0.8183	0.9325	0.9697 (86)
MIT	20.0087	20.1389	20.3918	20.6709	20.8777	20.9785	20.9961	20.9965	20.9578	20.7516	20.3554	19.9614 (87)
Th 2	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669	19.9669 (88)
util rest of house	0.9543	0.9353	0.8887	0.7949	0.6374	0.4002	0.2398	0.2315	0.4856	0.7676	0.9138	0.9620 (89)
MIT 2	19.1024	19.2277	19.4682	19.7226	19.8935	19.9589	19.9663	19.9664	19.9487	19.7975	19.4389	19.0571 (90)
Living area fraction									fLA = Living area / (4) =			0.2605 (91)
MIT	19.3385	19.4651	19.7088	19.9696	20.1499	20.2245	20.2346	20.2348	20.2116	20.0461	19.6777	19.2927 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3385	19.4651	19.7088	19.9696	20.1499	20.2245	20.2346	20.2348	20.2116	20.0461	19.6777	19.2927 (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	0.9476	0.9282	0.8826	0.7951	0.6501	0.4241	0.2678	0.2598	0.5087	0.7719	0.9076	0.9558	(94)
Useful gains	624.2720	667.6067	685.7839	644.4369	517.3267	341.1507	203.0298	195.1055	372.8924	532.1934	588.2928	589.2395	(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	1104.2231	1082.2468	973.2396	793.2632	566.6313	347.5789	203.7144	195.6917	386.7268	638.6607	890.3628	1092.5045	(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	357.0836	278.6382	213.8670	107.1550	36.6827	0.0000	0.0000	0.0000	0.0000	79.2117	217.4904	374.4292	(98)
Space heating												1664.5578	(98)
Space heating per m2												(98) / (4) =	23.6443 (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													1845.4077 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	357.0836	278.6382	213.8670	107.1550	36.6827	0.0000	0.0000	0.0000	0.0000	79.2117	217.4904	374.4292	(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)	395.8799	308.9115	237.1031	118.7971	40.6681	0.0000	0.0000	0.0000	0.0000	87.8178	241.1202	415.1100	(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	86.2888	86.4220	86.6279	87.5224	89.4361	76.2000	76.2000	76.2000	76.2000	83.3793	85.3906	76.2000	(216)
Fuel for water heating, kWh/month	135.5314	100.6667	71.4426	24.4594	1.9996	0.0000	0.0000	0.0000	29.3416	76.2473	112.5974	136.7869	(219)
Water heating fuel used												689.0728	(219)
Annual totals kWh/year													
Space heating fuel - main system												1845.4077	(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												2259.0516	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1845.4077	7.3800	136.1911 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	689.0728	7.3800	50.8536 (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			215.1067 (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	1845.4077	0.2160	398.6081 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	689.0728	0.2160	148.8397 (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			547.4478 (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			404.5002 (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	1845.4077	1.2200	2251.3974 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	689.0728	1.2200	840.6689 (264)
Space and water heating			3092.0663 (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			2246.4993 (272)
Primary energy kWh/m2/year			31.9105 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 6	Issued on Date	13/06/2024
Assessment Reference	AS Built	Prop Type Ref	Type B Terrace
Project	11, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.58	TER	18.88
Environmental	91 B	% DER<TER	33.39		
CO ₂ Emissions (t/year)	0.60	DFEE	44.23	TFEE	51.22
General Requirements Compliance	Pass	% DFEE<TFEE	13.64		

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 6	Issued on Date	13/06/2024
Assessment Reference	AS Built	Prop Type Ref	Type B Terrace
Project	11, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.58	TER	18.88
Environmental	91 B	% DER<TER	33.39		
CO ₂ Emissions (t/year)	0.60	DFEE	44.23	TFEE	51.22
General Requirements Compliance	Pass	% DFEE<TFEE	13.64		

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

Wall 000001

Wall Type: Standard Wall

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

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

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

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 6	Issued on Date	13/06/2024
Assessment Reference	AS Built	Prop Type Ref	Type B Terrace
Project	11, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.58	TER	18.88
Environmental	91 B	% DER<TER	33.39		
CO ₂ Emissions (t/year)	0.60	DFEE	44.23	TFEE	51.22
General Requirements Compliance	Pass	% DFEE<TFEE	13.64		

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 6	Issued on Date	13/06/2024
Assessment Reference	AS Built	Prop Type Ref	Type B Terrace
Project	11, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	12.58	TER	18.88
Environmental	91 B	% DER<TER	33.39		
CO ₂ Emissions (t/year)	0.60	DFEE	44.23	TFEE	51.22
General Requirements Compliance	Pass	% DFEE<TFEE	13.64		

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

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 6	Issued on Date	13/06/2024
Assessment Reference	AS Built	Prop Type Ref	Type B Terrace
Property	11, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	12.58
Environmental	91 B	TER	18.88
CO ₂ Emissions (t/year)	0.60	% DER<TER	33.39
General Requirements Compliance	Pass	DfEE	44.23
		TFEE	51.22
		% DfEE<TFEE	13.64
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
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	190.95	kJ/m ² K

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

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

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Stud	Plasterboard on timber frame		9.00	57.29
First Floor Stud	Plasterboard on timber frame		9.00	59.24

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	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	35.36
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	35.04

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	West	None	0.00					0.72	
Rear Elevation	Window	[1] Brick and Block	South	None	0.00					7.82	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

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	15.81	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 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	3.53	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
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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	