



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 28, Shaw Crescent
West End, Southampton, SO30 3LH

Contact: Tobias Whiting
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Report Issue Date: 28/05/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 27	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Property	28, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	13.00
Environmental	92 A	% DER<TER	34.01
CO ₂ Emissions (t/year)	0.50	DFEE	46.69
General Requirements Compliance	Pass	% DFEE<TFEE	10.50
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)	19.70	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.00	kgCO ₂ /m ²	Pass
	-6.70 (-34.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.16	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	46.69	kWh/m ² /yr	
	-5.5 (-10.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.18 (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	2.15 (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

0.17

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

2.88 m², No overhang

Windows facing South

3.00 m², No overhang

Windows facing West

5.55 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

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

2.15 (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
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	2.2	m ³ /m ² h
Photovoltaic array	0.80	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Environmental	92 A	TER	19.70
CO ₂ Emissions (t/year)	0.50	% DER<TER	34.01
General Requirements Compliance	Pass	DFEE	46.69
		TFEE	52.16
		% DFEE<TFEE	10.50
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	1.37	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	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	E2 Other lintels (including other steel lintels)	Independently assessed	0.061	1.81	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.020	6.92	0.14	Knauf P5
External wall	E4 Jamb	Independently assessed	0.015	22.20	0.33	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Default	0.320	24.48	7.83	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	24.48	1.71	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	1.80	0.11	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	0.240	1.60	0.38	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.056	1.60	0.09	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.048	12.00	0.58	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.102	4.80	-0.49	Knauf P24
External wall	E18 Party wall between dwellings	Independently assessed	0.026	2.60	0.07	Knauf P25/3
External wall	E25 Staggered party wall between dwellings	Independently assessed	0.062	4.80	0.30	Knauf P27 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	11.36	1.82	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	11.44	0.00	

Total: **13.50** W/mK:
Y-Value: **0.113** W/m²K:

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	0.50	DFEE	46.69	TFEE	52.16
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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

Semi-Detached Maisonette, total floor area 59 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) 19.70 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.00 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 46.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (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: 2.15 (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: 0.17
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing East: 2.88 m², No overhang

Windows facing South: 3.00 m², No overhang

Windows facing West: 5.55 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

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 2.2 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	59.3700 (1b)	x 2.4000 (2b)	= 142.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4880 (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							0 * 10 =	0.0000	(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) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							2.1500					
Infiltration rate							0.1075	(18)				
Number of sides sheltered							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.0994	(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)
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												
	0.1268	0.1243	0.1218	0.1094	0.1069	0.0945	0.0945	0.0920	0.0994	0.1069	0.1119	0.1168 (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)			11.4300	1.1450	13.0878			(27)
Ground Floor			59.3700	0.1200	7.1244	84.0000	4987.0800	(28a)
Brick and Block	58.7500	13.5800	45.1700	0.2500	11.2925	68.2600	3083.3042	(29a)
Pitched Roof	1.4900		1.4900	0.1000	0.1490	9.1000	13.5590	(30)
Total net area of external elements Aum(A, m2)			119.6100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.0187			(33)
Party Wall 1			14.2300	0.0000	0.0000	58.0600	826.1938	(32)
Party Wall 2			13.2500	0.0000	0.0000	58.0600	769.2950	(32)
Party Ceilings 1			58.1100			70.0000	4067.7000	(32b)
Ground Floor Block			31.6800			75.0000	2376.0000	(32c)
Ground Floor Stud			72.8200			9.0000	655.3800	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			16778.5120	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							282.6093	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5036	(36)
Total fabric heat loss				(33) + (36) =			47.5223	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9638 (42)
Average daily hot water use (litres/day)												80.8395 (43)
Daily hot water use	Jan 88.9234	Feb 85.6898	Mar 82.4562	Apr 79.2227	May 75.9891	Jun 72.7555	Jul 72.7555	Aug 75.9891	Sep 79.2227	Oct 82.4562	Nov 85.6898	Dec 88.9234 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	131.8708	115.3351	119.0155	103.7606	99.5607	85.9133	79.6113	91.3552	92.4462	107.7372	117.6036	127.7099 (45)
Energy content (annual)										Total =	Sum (45)m =	1271.9194 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.7806	17.3003	17.8523	15.5641	14.9341	12.8870	11.9417	13.7033	13.8669	16.1606	17.6405	19.1565 (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	1.3485	1.1365	1.1286	0.9453	0.8700	0.7188	0.6661	0.7983	0.8422	1.0216	1.1589	1.3060 (61)
Total heat required for water heating calculated for each month												
	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158 (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)
								Solar input (sum of months) =	Sum (63)m =			0.0000 (63)
Output from w/h												
	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158 (64)
								Total per year (kWh/year) =	Sum (64)m =			1283.8604 (64)
Heat gains from water heating, kWh/month												
	44.1842	38.6330	39.8548	34.7367	33.3215	28.7459	26.6373	30.5752	30.9489	36.0780	39.3929	42.7900 (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	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	15.4522	13.7245	11.1615	8.4500	6.3165	5.3326	5.7621	7.4898	10.0528	12.7643	14.8978	15.8817 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	171.3553	173.1334	168.6526	159.1134	147.0719	135.7546	128.1940	126.4159	130.8967	140.4359	152.4773	163.7946 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188 (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)												
	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507 (71)
Water heating gains (Table 5)												
	59.3873	57.4897	53.5683	48.2454	44.7869	39.9249	35.8028	41.0957	42.9846	48.4920	54.7124	57.5135 (72)
Total internal gains												
	301.6513	299.8041	288.8389	271.2654	253.6318	236.4686	225.2154	230.4578	239.3906	257.1486	277.5441	292.6463 (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		
East				2.8800	19.6403	0.6300	0.7000	0.7700		17.2867 (76)		
South				3.0000	46.7521	0.6300	0.7000	0.7700		42.8641 (78)		
West				5.5500	19.6403	0.6300	0.7000	0.7700		33.3129 (80)		
Solar gains	93.4637	169.1838	252.4345	338.8100	396.6810	399.6161	382.9867	340.0864	283.0020	193.1699	113.9003	78.6492 (83)
Total gains	395.1150	468.9879	541.2734	610.0754	650.3128	636.0847	608.2021	570.5443	522.3926	450.3185	391.4443	371.2954 (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	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133
alpha	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742
util living area												
	0.9982	0.9951	0.9848	0.9482	0.8497	0.6767	0.5068	0.5601	0.8150	0.9715	0.9958	0.9987 (86)
MIT	19.8731	20.0366	20.2928	20.6001	20.8462	20.9656	20.9939	20.9898	20.9084	20.5713	20.1496	19.8295 (87)
Th 2	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228 (88)
util rest of house												
	0.9975	0.9932	0.9788	0.9274	0.7946	0.5791	0.3866	0.4356	0.7311	0.9560	0.9939	0.9982 (89)
MIT 2	18.9045	19.0671	19.3199	19.6138	19.8270	19.9090	19.9216	19.9205	19.8777	19.5931	19.1803	18.8609 (90)
Living area fraction									fLA =	Living area / (4) =		
MIT	19.2972	19.4602	19.7144	20.0136	20.2402	20.3374	20.3563	20.3540	20.2956	19.9896	19.5733	19.2536 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2972	19.4602	19.7144	20.0136	20.2402	20.3374	20.3563	20.3540	20.2956	19.9896	19.5733	19.2536 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9969	0.9922	0.9774	0.9295	0.8124	0.6184	0.4357	0.4867	0.7630	0.9572	0.9930	0.9978 (94)
Useful gains	393.9091	465.3088	529.0160	567.0625	528.3092	393.3267	265.0238	277.6653	398.5775	431.0233	388.7202	370.4710 (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												
	1065.2921	1034.2511	938.6536	789.4337	606.6343	407.5423	266.8212	280.8622	440.0897	666.9730	886.0120	1069.2985 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	499.5089	382.3293	304.7704	160.1073	58.2738	0.0000	0.0000	0.0000	0.0000	175.5466	358.0501	519.9277 (98)
Space heating												2458.5140 (98)
Space heating per m2										(98) / (4) =		41.4100 (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												2725.6253 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	499.5089	382.3293	304.7704	160.1073	58.2738	0.0000	0.0000	0.0000	0.0000	175.5466	358.0501	519.9277 (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)	553.7793	423.8684	337.8829	177.5025	64.6051	0.0000	0.0000	0.0000	0.0000	194.6193	396.9513	576.4165 (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	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158 (64)
Efficiency of water heater (217)m	86.8407	86.4895	85.7456	84.0912	80.8052	76.2000	76.2000	76.2000	76.2000	84.2767	86.2529	76.2000 (216)
Fuel for water heating, kWh/month	153.4066	134.6656	140.1168	124.5147	124.2876	113.6905	105.3510	120.9364	122.4258	129.0496	137.6910	148.2576 (219)
Water heating fuel used												1554.3931 (219)
Annual totals kWh/year												
Space heating fuel - main system												2725.6253 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2380)												
mechanical ventilation fans (SFP = 0.2380)												41.3728 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												116.3728 (231)
Electricity for lighting (calculated in Appendix L)												272.8907 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.80 * 1068 * 1.00) =												-683.5651
Total delivered energy for all uses												3985.7167 (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	2725.6253	0.2160	588.7351 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1554.3931	0.2160	335.7489 (264)
Space and water heating			924.4840 (265)
Pumps and fans	116.3728	0.5190	60.3975 (267)
Energy for lighting	272.8907	0.5190	141.6303 (268)
Energy saving/generation technologies			
PV Unit	-683.5651	0.5190	-354.7703 (269)
Total CO2, kg/year			771.7414 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.0000 (273)

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

DER			13.0000 ZC1
Total Floor Area		TFA	59.3700
Assumed number of occupants		N	1.9638
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.1032 ZC2
CO2 emissions from cooking, equation (L16)			2.7982 ZC3
Total CO2 emissions			32.9014 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			32.9014 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	59.3700 (1b)	x 2.4000 (2b)	= 142.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (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) =				20.0000 / (5) = 0.1404 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3904 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3611 (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												
Effective ac	0.4604	0.4514	0.4423	0.3972	0.3882	0.3430	0.3430	0.3340	0.3611	0.3882	0.4062	0.4243 (22b)
Effective ac	0.6060	0.6019	0.5978	0.5789	0.5753	0.5588	0.5588	0.5558	0.5652	0.5753	0.5825	0.5900 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			11.4300	1.3258	15.1534		(27)
Ground Floor			59.3700	0.1300	7.7181		(28a)
Brick and Block	58.7500	13.5800	45.1700	0.1800	8.1306		(29a)
Pitched Roof	1.4900		1.4900	0.1300	0.1937		(30)
Total net area of external elements Aum(A, m ²)			119.6100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	33.3458	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1517 (36)
Total fabric heat loss						(33) + (36) =	43.4975 (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	28.4937	28.3002	28.1105	27.2196	27.0529	26.2770	26.2770	26.1333	26.5759	27.0529	27.3901	27.7426 (38)
Heat transfer coeff	71.9912	71.7977	71.6080	70.7171	70.5504	69.7745	69.7745	69.6308	70.0734	70.5504	70.8876	71.2401 (39)
Average = Sum(39)m / 12 =												70.7163 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2126	1.2093	1.2061	1.1911	1.1883	1.1752	1.1752	1.1728	1.1803	1.1883	1.1940	1.1999 (40)
HLP (average)												1.1911 (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												1.9638 (42)
Average daily hot water use (litres/day)												80.8395 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	88.9234	85.6898	82.4562	79.2227	75.9891	72.7555	72.7555	75.9891	79.2227	82.4562	85.6898	88.9234 (44)
Energy conte	131.8708	115.3351	119.0155	103.7606	99.5607	85.9133	79.6113	91.3552	92.4462	107.7372	117.6036	127.7099 (45)
Energy content (annual)										Total = Sum(45)m =		1271.9194 (45)
Distribution loss (46)m = 0.15 x (45)m	19.7806	17.3003	17.8523	15.5641	14.9341	12.8870	11.9417	13.7033	13.8669	16.1606	17.6405	19.1565 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	45.3144	39.4408	42.0188	39.0687	38.7232	35.8794	37.0754	38.7232	39.0687	42.0188	42.2580	45.3144 (61)
Total heat required for water heating calculated for each month	177.1852	154.7759	161.0343	142.8293	138.2839	121.7928	116.6868	130.0784	131.5150	149.7560	159.8616	173.0243 (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	177.1852	154.7759	161.0343	142.8293	138.2839	121.7928	116.6868	130.0784	131.5150	149.7560	159.8616	173.0243 (64)
Heat gains from water heating, kWh/month	55.1756	48.2091	50.0773	44.2676	42.7847	37.5360	35.7396	40.0564	40.5056	46.3273	49.6677	53.7921 (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	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4522	13.7245	11.1615	8.4500	6.3165	5.3326	5.7621	7.4898	10.0528	12.7643	14.8978	15.8817	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.3553	173.1334	168.6526	159.1134	147.0719	135.7546	128.1940	126.4159	130.8967	140.4359	152.4773	163.7946	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	(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)	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	(71)
Water heating gains (Table 5)	74.1608	71.7397	67.3083	61.4827	57.5064	52.1334	48.0371	53.8392	56.2577	62.2679	68.9829	72.3012	(72)
Total internal gains	316.4248	314.0542	302.5789	284.5026	266.3513	248.6772	237.4497	243.2014	252.6637	270.9246	291.8146	307.4341	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
East	2.8800	19.6403	0.6300		0.7000	0.7700	17.2867	(76)
South	3.0000	46.7521	0.6300		0.7000	0.7700	42.8641	(78)
West	5.5500	19.6403	0.6300		0.7000	0.7700	33.3129	(80)

Solar gains	93.4637	169.1838	252.4345	338.8100	396.6810	399.6161	382.9867	340.0864	283.0020	193.1699	113.9003	78.6492	(83)
Total gains	409.8885	483.2380	555.0134	623.3127	663.0323	648.2933	620.4365	583.2878	535.6657	464.0945	405.7149	386.0832	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.2698	57.4241	57.5762	58.3015	58.4393	59.0891	59.0891	59.2111	58.8371	58.4393	58.1613	57.8735	
alpha	4.8180	4.8283	4.8384	4.8868	4.8960	4.9393	4.9393	4.9474	4.9225	4.8960	4.8774	4.8582	
util living area	0.9963	0.9913	0.9769	0.9317	0.8260	0.6506	0.4870	0.5360	0.7859	0.9582	0.9922	0.9972	(86)
MIT	19.7583	19.9407	20.2232	20.5683	20.8296	20.9610	20.9923	20.9879	20.9017	20.5459	20.0854	19.7274	(87)
Th 2	19.9099	19.9125	19.9151	19.9271	19.9294	19.9399	19.9399	19.9418	19.9358	19.9294	19.9248	19.9201	(88)
util rest of house	0.9951	0.9884	0.9690	0.9083	0.7710	0.5583	0.3737	0.4193	0.7035	0.9389	0.9891	0.9963	(89)
MIT 2	18.2699	18.5368	18.9454	19.4358	19.7697	19.9152	19.9372	19.9371	19.8618	19.4175	18.7576	18.2319	(90)
Living area fraction									fLA = Living area / (4) =			0.4054	(91)
MIT	18.8734	19.1059	19.4635	19.8949	20.1994	20.3392	20.3650	20.3631	20.2834	19.8750	19.2959	18.8382	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8734	19.1059	19.4635	19.8949	20.1994	20.3392	20.3650	20.3631	20.2834	19.8750	19.2959	18.8382	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	407.1797	476.2467	535.5167	565.6503	521.2328	385.4160	260.5134	272.3304	392.5358	435.1835	400.2741	384.1303	(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	1049.1540	1019.9535	928.2870	777.5307	599.6363	400.4519	262.6983	275.9574	433.2917	654.3571	864.5393	1042.8278	(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	477.6289	365.3710	292.2211	152.5540	58.3322	0.0000	0.0000	0.0000	0.0000	163.0651	334.2709	490.0709	(98)
Space heating												2333.5141	(98)
Space heating per m2												39.3046	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													2498.4090 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	477.6289	365.3710	292.2211	152.5540	58.3322	0.0000	0.0000	0.0000	0.0000	163.0651	334.2709	490.0709	(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)	511.3800	391.1895	312.8706	163.3340	62.4542	0.0000	0.0000	0.0000	0.0000	174.5879	357.8918	524.7012	(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	177.1852	154.7759	161.0343	142.8293	138.2839	121.7928	116.6868	130.0784	131.5150	149.7560	159.8616	173.0243	(64)
Efficiency of water heater (217)m	87.4246	87.1387	86.5331	85.2172	83.0529	80.3000	80.3000	80.3000	80.3000	85.2658	86.8653	87.5274	(217)
Fuel for water heating, kWh/month	202.6721	177.6202	186.0956	167.6062	166.5010	151.6722	145.3135	161.9905	163.7795	175.6342	184.0339	197.6802	(219)
Water heating fuel used												2080.5990	(219)
Annual totals kWh/year													
Space heating fuel - main system												2498.4090	(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)												272.8907	(232)
Total delivered energy for all uses												4926.8987	(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	2498.4090	0.2160	539.6564 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2080.5990	0.2160	449.4094 (264)
Space and water heating			989.0657 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	272.8907	0.5190	141.6303 (268)
Total CO2, kg/m2/year			1169.6210 (272)
Emissions per m2 for space and water heating			16.6594 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3856 (272b)
Emissions per m2 for pumps and fans			0.6556 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.6594 * 1.00) + 2.3856 + 0.6556, rounded to 2 d.p.			19.7000 (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	59.3700 (1b)	x 2.4000 (2b)	= 142.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (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					20.0000 / (5) = 0.1404 (8)
Measured/design AP50					Yes
Infiltration rate					2.1500
Number of sides sheltered					0.2479 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2293 (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												
	0.2923	0.2866	0.2809	0.2522	0.2465	0.2178	0.2178	0.2121	0.2293	0.2465	0.2579	0.2694 (22b)
Effective ac	0.5427	0.5411	0.5394	0.5318	0.5304	0.5237	0.5237	0.5225	0.5263	0.5304	0.5333	0.5363 (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)			11.4300	1.1450	13.0878		(27)
Ground Floor			59.3700	0.1200	7.1244	84.0000	4987.0800 (28a)
Brick and Block	58.7500	13.5800	45.1700	0.2500	11.2925	68.2600	3083.3042 (29a)
Pitched Roof	1.4900		1.4900	0.1000	0.1490	9.1000	13.5590 (30)
Total net area of external elements Aum(A, m ²)			119.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.0187		(33)
Party Wall 1			14.2300	0.0000	0.0000	58.0600	826.1938 (32)
Party Wall 2			13.2500	0.0000	0.0000	58.0600	769.2950 (32)
Party Ceilings 1			58.1100			30.0000	1743.3000 (32b)
Ground Floor Block			31.6800			75.0000	2376.0000 (32c)
Ground Floor Stud			72.8200			9.0000	655.3800 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 14454.1120 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							243.4582 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5036 (36)
Total fabric heat loss							(33) + (36) = 47.5223 (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	25.5196	25.4415	25.3651	25.0059	24.9387	24.6259	24.6259	24.5679	24.7464	24.9387	25.0747	25.2168 (38)
Heat transfer coeff	73.0419	72.9638	72.8874	72.5282	72.4610	72.1482	72.1482	72.0902	72.2687	72.4610	72.5969	72.7391 (39)
Average = Sum(39)m / 12 =												72.5279 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2303	1.2290	1.2277	1.2216	1.2205	1.2152	1.2152	1.2143	1.2173	1.2205	1.2228	1.2252 (40)
HLP (average)												1.2216 (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												1.9638 (42)
Average daily hot water use (litres/day)												80.8395 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	88.9234	85.6898	82.4562	79.2227	75.9891	72.7555	72.7555	75.9891	79.2227	82.4562	85.6898	88.9234 (44)
Energy conte	131.8708	115.3351	119.0155	103.7606	99.5607	85.9133	79.6113	91.3552	92.4462	107.7372	117.6036	127.7099 (45)
Energy content (annual)												Total = Sum(45)m = 1271.9194 (45)
Distribution loss (46)m = 0.15 x (45)m												

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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)
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	28.0226	24.5087	25.2908	22.0491	21.1567	18.2566	16.9174	19.4130	19.6448	22.8942	24.9908	27.1383 (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	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4522	13.7245	11.1615	8.4500	6.3165	5.3326	5.7621	7.4898	10.0528	12.7643	14.8978	15.8817	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.3553	173.1334	168.6526	159.1134	147.0719	135.7546	128.1940	126.4159	130.8967	140.4359	152.4773	163.7946	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	(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)	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	(71)
Water heating gains (Table 5)	37.6647	36.4713	33.9930	30.6238	28.4364	25.3564	22.7385	26.0927	27.2845	30.7717	34.7094	36.4763	(72)
Total internal gains	276.9287	275.7857	266.2636	250.6437	234.2813	218.9001	209.1510	212.4549	220.6905	236.4284	254.5411	268.6091	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				2.8800	19.6403	0.6300		0.7000		0.7700		17.2867 (76)
South				3.0000	46.7521	0.6300		0.7000		0.7700		42.8641 (78)
West				5.5500	19.6403	0.6300		0.7000		0.7700		33.3129 (80)
Solar gains	93.4637	169.1838	252.4345	338.8100	396.6810	399.6161	382.9867	340.0864	283.0020	193.1699	113.9003	78.6492 (83)
Total gains	370.3924	444.9696	518.6981	589.4537	630.9623	618.5163	592.1378	552.5413	503.6925	429.5983	368.4414	347.2582 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.9689	55.0277	55.0854	55.3582	55.4095	55.6498	55.6498	55.6945	55.5570	55.4095	55.3058	55.1977	
alpha	4.6646	4.6685	4.6724	4.6905	4.6940	4.7100	4.7100	4.7130	4.7038	4.6940	4.6871	4.6798	
util living area	0.9973	0.9933	0.9814	0.9433	0.8504	0.6877	0.5225	0.5773	0.8205	0.9680	0.9943	0.9980	(86)
MIT	19.6466	19.8336	20.1277	20.4875	20.7810	20.9419	20.9872	20.9798	20.8638	20.4615	19.9756	19.6054	(87)
Th 2	19.8959	19.8969	19.8979	19.9027	19.9036	19.9078	19.9078	19.9086	19.9062	19.9036	19.9018	19.8999	(88)
util rest of house	0.9964	0.9911	0.9749	0.9232	0.7989	0.5928	0.3997	0.4515	0.7421	0.9526	0.9921	0.9973	(89)
MIT 2	18.6702	18.8570	19.1482	19.4981	19.7596	19.8818	19.9047	19.9030	19.8331	19.4813	19.0032	18.6324	(90)
Living area fraction									fLA = Living area / (4) =			0.4054	(91)
MIT	19.0661	19.2529	19.5453	19.8992	20.1737	20.3116	20.3435	20.3396	20.2510	19.8787	19.3974	19.0269	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0661	19.2529	19.5453	19.8992	20.1737	20.3116	20.3435	20.3396	20.2510	19.8787	19.3974	19.0269	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9955	0.9893	0.9723	0.9231	0.8130	0.6298	0.4499	0.5029	0.7695	0.9522	0.9907	0.9966	(94)
Ext temp.	368.7260	440.2259	504.3467	544.1277	512.9515	389.5547	266.4062	277.8752	387.6087	409.0485	365.0016	346.0851	(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	1078.5408	1047.2437	950.8378	797.7533	614.0131	412.0818	270.0895	284.0065	444.5220	672.3411	892.7571	1078.4936	(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	528.1023	407.9160	332.1894	182.6104	75.1898	0.0000	0.0000	0.0000	0.0000	195.8897	379.9840	544.9119	(98)
Space heating per m2												2646.7935	(98)
												(98) / (4) =	44.5813 (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	678.1929	533.8965	547.8859	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8840	0.9361	0.9162	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	599.5399	499.7723	501.9469	0.0000	0.0000	0.0000	0.0000	(102)

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Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	796.4123	764.1465	719.0229	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	141.7481	196.6944	161.5045	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												499.9470 (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	35.4370	49.1736	40.3761	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												124.9868 (107)
Space cooling per m2												2.1052 (108)
Energy for space heating												44.5813 (99)
Energy for space cooling												2.1052 (108)
Total												46.6865 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.7 (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	59.3700 (1b)	x 2.4000 (2b)	= 142.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4880 (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					2 * 10 = 20.0000 (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 20.0000 / (5) = 0.1404 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3904 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3611 (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												
Effective ac	0.4604	0.4514	0.4423	0.3972	0.3882	0.3430	0.3430	0.3340	0.3611	0.3882	0.4062	0.4243 (22b)
Effective ac	0.6060	0.6019	0.5978	0.5789	0.5753	0.5588	0.5588	0.5558	0.5652	0.5753	0.5825	0.5900 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			11.4300	1.3258	15.1534		(27)
Ground Floor			59.3700	0.1300	7.7181		(28a)
Brick and Block	58.7500	13.5800	45.1700	0.1800	8.1306		(29a)
Pitched Roof	1.4900		1.4900	0.1300	0.1937		(30)
Total net area of external elements Aum(A, m ²)			119.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.3458		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1517 (36)
Total fabric heat loss						(33) + (36) =	43.4975 (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	28.4937	28.3002	28.1105	27.2196	27.0529	26.2770	26.2770	26.1333	26.5759	27.0529	27.3901	27.7426 (38)
Heat transfer coeff	71.9912	71.7977	71.6080	70.7171	70.5504	69.7745	69.7745	69.6308	70.0734	70.5504	70.8876	71.2401 (39)
Average = Sum(39)m / 12 =												70.7163 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2126	1.2093	1.2061	1.1911	1.1883	1.1752	1.1752	1.1728	1.1803	1.1883	1.1940	1.1999 (40)
HLP (average)												1.1911 (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												1.9638 (42)
Average daily hot water use (litres/day)												80.8395 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	88.9234	85.6898	82.4562	79.2227	75.9891	72.7555	72.7555	75.9891	79.2227	82.4562	85.6898	88.9234 (44)
Energy conte	131.8708	115.3351	119.0155	103.7606	99.5607	85.9133	79.6113	91.3552	92.4462	107.7372	117.6036	127.7099 (45)
Energy content (annual)										Total = Sum(45)m =		1271.9194 (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	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	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	0.0000 (57)

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Calculation Type: New Build (As Built)

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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	28.0226	24.5087	25.2908	22.0491	21.1567	18.2566	16.9174	19.4130	19.6448	22.8942	24.9908	27.1383 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883	98.1883 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4522	13.7245	11.1615	8.4500	6.3165	5.3326	5.7621	7.4898	10.0528	12.7643	14.8978	15.8817 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.3553	173.1334	168.6526	159.1134	147.0719	135.7546	128.1940	126.4159	130.8967	140.4359	152.4773	163.7946 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188	32.8188 (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)	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507 (71)
Water heating gains (Table 5)	37.6647	36.4713	33.9930	30.6238	28.4364	25.3564	22.7385	26.0927	27.2845	30.7717	34.7094	36.4763 (72)
Total internal gains	276.9287	275.7857	266.2636	250.6437	234.2813	218.9001	209.1510	212.4549	220.6905	236.4284	254.5411	268.6091 (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
East	2.8800	19.6403	0.6300	0.7000	0.7700	17.2867 (76)
South	3.0000	46.7521	0.6300	0.7000	0.7700	42.8641 (78)
West	5.5500	19.6403	0.6300	0.7000	0.7700	33.3129 (80)

Solar gains	93.4637	169.1838	252.4345	338.8100	396.6810	399.6161	382.9867	340.0864	283.0020	193.1699	113.9003	78.6492 (83)
Total gains	370.3924	444.9696	518.6981	589.4537	630.9623	618.5163	592.1378	552.5413	503.6925	429.5983	368.4414	347.2582 (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	57.2698	57.4241	57.5762	58.3015	58.4393	59.0891	59.0891	59.2111	58.8371	58.4393	58.1613	57.8735
alpha	4.8180	4.8283	4.8384	4.8868	4.8960	4.9393	4.9393	4.9474	4.9225	4.8960	4.8774	4.8582
util living area	0.9976	0.9939	0.9823	0.9433	0.8462	0.6750	0.5085	0.5626	0.8137	0.9685	0.9948	0.9983 (86)
MIT	19.6976	19.8831	20.1720	20.5296	20.8080	20.9543	20.9907	20.9851	20.8841	20.5010	20.0289	19.6672 (87)
Th 2	19.9099	19.9125	19.9151	19.9271	19.9294	19.9399	19.9399	19.9418	19.9358	19.9294	19.9248	19.9201 (88)
util rest of house	0.9968	0.9918	0.9760	0.9230	0.7941	0.5818	0.3912	0.4417	0.7346	0.9532	0.9927	0.9977 (89)
MIT 2	18.7298	18.9163	19.2036	19.5570	19.8044	19.9198	19.9376	19.9378	19.8746	19.5387	19.0721	18.7076 (90)
Living area fraction									fLA = Living area / (4) =			0.4054 (91)
MIT	19.1221	19.3083	19.5962	19.9513	20.2113	20.3392	20.3646	20.3624	20.2839	19.9288	19.4600	19.0966 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1221	19.3083	19.5962	19.9513	20.2113	20.3392	20.3646	20.3624	20.2839	19.9288	19.4600	19.0966 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9960	0.9902	0.9737	0.9235	0.8092	0.6186	0.4391	0.4912	0.7632	0.9532	0.9915	0.9970 (94)
Ext temp.	368.9118	440.6220	505.0642	544.3778	510.5688	382.6098	260.0129	271.3852	384.3936	409.4937	365.3001	346.2299 (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	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	519.4239	399.0731	321.9500	170.7383	66.8908	0.0000	0.0000	0.0000	0.0000	185.0023	367.8277	531.9669 (98)
Space heating per m2												2562.8730 (98)
										(98) / (4) =		43.1678 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	655.8805	516.3315	529.1943	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9012	0.9482	0.9309	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	591.0540	489.5698	492.6258	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	796.4123	764.1465	719.0229	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	147.8580	204.2851	168.4394	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												520.5825 (104)
												fC = cooled area / (4) = 1.0000 (105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	36.9645	51.0713	42.1099	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											130.1456 (107)
Space cooling per m2											2.1921 (108)
Energy for space heating											43.1678 (99)
Energy for space cooling											2.1921 (108)
Total											45.3599 (109)
Target Fabric Energy Efficiency (TFEE)											52.2 (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	59.3700 (1b)	x 2.4000 (2b)	= 142.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					2.1500
Number of sides sheltered					0.1075 (18)
					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.0994 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	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	0.1168	0.1094	0.1094	0.0994	0.1019	0.0970	0.0970	0.0945	0.0945	0.1019	0.0994	0.1019 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			11.4300	1.1450	13.0878		(27)
Ground Floor			59.3700	0.1200	7.1244	84.0000	4987.0800 (28a)
Brick and Block	58.7500	13.5800	45.1700	0.2500	11.2925	68.2600	3083.3042 (29a)
Pitched Roof	1.4900		1.4900	0.1000	0.1490	9.1000	13.5590 (30)
Total net area of external elements Aum(A, m ²)			119.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.0187		(33)
Party Wall 1			14.2300	0.0000	0.0000	58.0600	826.1938 (32)
Party Wall 2			13.2500	0.0000	0.0000	58.0600	769.2950 (32)
Party Ceilings 1			58.1100			70.0000	4067.7000 (32b)
Ground Floor Block			31.6800			75.0000	2376.0000 (32c)
Ground Floor Stud			72.8200			9.0000	655.3800 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 16778.5120 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							282.6093 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5036 (36)
Total fabric heat loss							(33) + (36) = 47.5223 (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	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105 (38)
Heat transfer coeff	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328 (39)
Average = Sum(39)m / 12 =												71.0328 (39)
HLP	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964 (40)
HLP (average)												1.1964 (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												1.9638 (42)
Average daily hot water use (litres/day)												80.8395 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	88.9234	85.6898	82.4562	79.2227	75.9891	72.7555	72.7555	75.9891	79.2227	82.4562	85.6898	88.9234 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)	131.8708	115.3351	119.0155	103.7606	99.5607	85.9133	79.6113	91.3552	92.4462	107.7372	117.6036	127.7099 (45)
Distribution loss (46)m = 0.15 x (45)m	19.7806	17.3003	17.8523	15.5641	14.9341	12.8870	11.9417	13.7033	13.8669	16.1606	17.6405	1271.9194 (45)
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	1.3485	1.1365	1.1286	0.9453	0.8700	0.7188	0.6661	0.7983	0.8422	1.0216	1.1589	1.3060 (61)
Total heat required for water heating calculated for each month	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158 (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	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158 (64)
RHI water heating demand	44.1842	38.6330	39.8548	34.7367	33.3215	28.7459	26.6373	30.5752	30.9489	36.0780	39.3929	42.7900 (65)
Heat gains from water heating, kWh/month												
	44.1842	38.6330	39.8548	34.7367	33.3215	28.7459	26.6373	30.5752	30.9489	36.0780	39.3929	42.7900 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.6305	34.3113	27.9038	21.1250	15.7912	13.3316	14.4052	18.7245	25.1319	31.9108	37.2446	39.7042 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	255.7542	258.4081	251.7203	237.4827	219.5104	202.6189	191.3343	188.6804	195.3682	209.6058	227.5781	244.4696 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464 (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)	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507 (71)
Water heating gains (Table 5)	59.3873	57.4897	53.5683	48.2454	44.7869	39.9249	35.8028	41.0957	42.9846	48.4920	54.7124	57.5135 (72)
Total internal gains	444.7937	441.2307	424.2140	397.8748	371.1101	346.8970	332.5641	339.5222	354.5065	381.0302	410.5568	432.7090 (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	
East				2.8800	25.1733	0.6300	0.7000	0.7700			22.1566 (76)	
South				3.0000	56.5862	0.6300	0.7000	0.7700			51.8804 (78)	
West				5.5500	25.1733	0.6300	0.7000	0.7700			42.6977 (80)	
Solar gains	116.7347	179.9790	273.5622	368.8257	406.6793	453.5657	417.5449	386.5529	321.1156	221.8008	141.8280	92.9673 (83)
Total gains	561.5285	621.2097	697.7762	766.7005	777.7894	800.4627	750.1089	726.0751	675.6221	602.8310	552.3848	525.6762 (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	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133 (86)
alpha	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742 (86)
util living area	0.9863	0.9763	0.9416	0.8472	0.6818	0.4491	0.3121	0.3126	0.5742	0.8625	0.9680	0.9895 (86)
MIT	20.2314	20.3468	20.5805	20.8226	20.9560	20.9960	20.9996	20.9996	20.9860	20.8402	20.5075	20.1936 (87)
Th 2	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228 (88)
util rest of house	0.9812	0.9678	0.9215	0.8008	0.6037	0.3561	0.2105	0.2076	0.4709	0.8069	0.9542	0.9854 (89)
MIT 2	19.2591	19.3710	19.5922	19.8037	19.9013	19.9218	19.9228	19.9228	19.9184	19.8243	19.5284	19.2223 (90)
Living area fraction	19.6533	19.7666	19.9929	20.2168	20.3289	20.3573	20.3593	20.3594	20.3512	20.2362	19.9253	19.6161 (92)
MIT	19.6533	19.7666	19.9929	20.2168	20.3289	20.3573	20.3593	20.3594	20.3512	20.2362	19.9253	19.6161 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6533	19.7666	19.9929	20.2168	20.3289	20.3573	20.3593	20.3594	20.3512	20.2362	19.9253	19.6161 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	550.0802	600.2675	644.0610	624.5423	493.3280	315.3023	188.8154	181.7182	346.5717	497.2186	527.1324	517.2611 (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	998.2451	977.8804	880.3020	718.6214	513.4916	316.6154	188.9009	181.7980	351.7000	577.9337	804.4699	988.4992 (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	333.4347	253.7559	175.7633	67.7369	15.0017	0.0000	0.0000	0.0000	0.0000	60.0520	199.6830	350.6011 (98)
Space heating												1456.0287 (98)
RHI space heating demand												1456 (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	59.3700 (1b)	x 2.4000 (2b)	= 142.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.1500
Infiltration rate					0.1075 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.0994 (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	0.1268	0.1243	0.1218	0.1094	0.1069	0.0945	0.0945	0.0920	0.0994	0.1069	0.1119	0.1168 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			11.4300	1.1450	13.0878		(27)
Ground Floor			59.3700	0.1200	7.1244	84.0000	4987.0800 (28a)
Brick and Block	58.7500	13.5800	45.1700	0.2500	11.2925	68.2600	3083.3042 (29a)
Pitched Roof	1.4900		1.4900	0.1000	0.1490	9.1000	13.5590 (30)
Total net area of external elements Aum(A, m ²)			119.6100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.0187		(33)
Party Wall 1			14.2300	0.0000	0.0000	58.0600	826.1938 (32)
Party Wall 2			13.2500	0.0000	0.0000	58.0600	769.2950 (32)
Party Ceilings 1			58.1100			70.0000	4067.7000 (32b)
Ground Floor Block			31.6800			75.0000	2376.0000 (32c)
Ground Floor Stud			72.8200			9.0000	655.3800 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				16778.5120 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							282.6093 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5036 (36)
Total fabric heat loss			(33) + (36) =				47.5223 (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	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105	23.5105 (38)
Heat transfer coeff	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328	71.0328 (39)
Average = Sum(39)m / 12 =												71.0328 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964	1.1964 (40)
HLP (average)												1.1964 (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												1.9638 (42)
Average daily hot water use (litres/day)												80.8395 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	88.9234	85.6898	82.4562	79.2227	75.9891	72.7555	72.7555	75.9891	79.2227	82.4562	85.6898	88.9234 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	131.8708	115.3351	119.0155	103.7606	99.5607	85.9133	79.6113	91.3552	92.4462	107.7372	117.6036	127.7099 (45)
Energy content (annual)										Total =	Sum (45)m =	1271.9194 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.7806	17.3003	17.8523	15.5641	14.9341	12.8870	11.9417	13.7033	13.8669	16.1606	17.6405	19.1565 (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	1.3485	1.1365	1.1286	0.9453	0.8700	0.7188	0.6661	0.7983	0.8422	1.0216	1.1589	1.3060 (61)
Total heat required for water heating calculated for each month												
	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158 (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)
										Solar input (sum of months) =	Sum (63)m =	0.0000 (63)
Output from w/h												
	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158 (64)
										Total per year (kWh/year) =	Sum (64)m =	1283.8604 (64)
Heat gains from water heating, kWh/month												
	44.1842	38.6330	39.8548	34.7367	33.3215	28.7459	26.6373	30.5752	30.9489	36.0780	39.3929	42.7900 (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	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	38.6305	34.3113	27.9038	21.1250	15.7912	13.3316	14.4052	18.7245	25.1319	31.9108	37.2446	39.7042 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	255.7542	258.4081	251.7203	237.4827	219.5104	202.6189	191.3343	188.6804	195.3682	209.6058	227.5781	244.4696 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464 (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)												
	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507 (71)
Water heating gains (Table 5)												
	59.3873	57.4897	53.5683	48.2454	44.7869	39.9249	35.8028	41.0957	42.9846	48.4920	54.7124	57.5135 (72)
Total internal gains												
	444.7937	441.2307	424.2140	397.8748	371.1101	346.8970	332.5641	339.5222	354.5065	381.0302	410.5568	432.7090 (73)

6. Solar gains

[Jan]				Area	Solar flux	g	FF	Access	Gains			
				m2	Table 6a	Specific data	Specific data	factor	W			
					W/m2	or Table 6b	or Table 6c	Table 6d				
East				2.8800	19.6403	0.6300	0.7000	0.7700	17.2867 (76)			
South				3.0000	46.7521	0.6300	0.7000	0.7700	42.8641 (78)			
West				5.5500	19.6403	0.6300	0.7000	0.7700	33.3129 (80)			
Solar gains	93.4637	169.1838	252.4345	338.8100	396.6810	399.6161	382.9867	340.0864	283.0020	193.1699	113.9003	78.6492 (83)
Total gains	538.2574	610.4146	676.6485	736.6848	767.7911	746.5131	715.5508	679.6087	637.5085	574.2001	524.4571	511.3581 (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	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133
alpha	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742
util living area												
	0.9921	0.9837	0.9615	0.9003	0.7736	0.5917	0.4339	0.4759	0.7156	0.9281	0.9841	0.9940 (86)
MIT	20.0718	20.2271	20.4601	20.7207	20.9051	20.9816	20.9971	20.9952	20.9517	20.7071	20.3294	20.0251 (87)
Th 2	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228 (88)
util rest of house												
	0.9893	0.9781	0.9482	0.8676	0.7100	0.4999	0.3293	0.3671	0.6250	0.8966	0.9775	0.9918 (89)
MIT 2	19.1014	19.2539	19.4790	19.7182	19.8674	19.9159	19.9223	19.9218	19.9013	19.7131	19.3562	19.0552 (90)
Living area fraction									fLA =	Living area / (4) =		
MIT	19.4948	19.6484	19.8768	20.1246	20.2881	20.3480	20.3580	20.3570	20.3271	20.1161	19.7507	19.4484 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4948	19.6484	19.8768	20.1246	20.2881	20.3480	20.3580	20.3570	20.3271	20.1161	19.7507	19.4484 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9879	0.9763	0.9475	0.8745	0.7329	0.5370	0.3719	0.4115	0.6608	0.9031	0.9762	0.9906 (94)
Useful gains	531.7655	595.9757	641.1554	644.1984	562.6943	400.9131	266.1046	279.6380	421.2906	518.5670	511.9656	506.5370 (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												
	1079.3326	1047.6234	950.1908	797.3170	610.0381	408.2942	266.9423	281.0766	442.3313	675.9519	898.6174	1083.1382 (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												
	407.3899	303.5073	229.9223	110.2454	35.2237	0.0000	0.0000	0.0000	0.0000	117.0944	278.3893	428.9913 (98)
Space heating												1910.7635 (98)
Space heating per m ²										(98) / (4) =		32.1840 (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												2118.3631	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.3899	303.5073	229.9223	110.2454	35.2237	0.0000	0.0000	0.0000	0.0000	117.0944	278.3893	428.9913	(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)	451.6518	336.4826	254.9028	122.2232	39.0507	0.0000	0.0000	0.0000	0.0000	129.8164	308.6356	475.6001	(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	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158	(64)
Efficiency of water heater	86.2931	85.8269	84.8497	82.7906	79.3999	76.2000	76.2000	76.2000	76.2000	82.8684	85.5024	76.2000	(216)
(217)m	86.2931	85.8269	84.8497	82.7906	79.3999	76.2000	76.2000	76.2000	76.2000	82.8684	85.5024	86.5245	(217)
Fuel for water heating, kWh/month	154.3801	135.7053	141.5962	126.4708	126.4872	113.6905	105.3510	120.9364	122.4258	131.2428	138.8995	149.1090	(219)
Water heating fuel used												1566.2947	(219)
Annual totals kWh/year													
Space heating fuel - main system												2118.3631	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												41.3728	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												116.3728	(231)
Electricity for lighting (calculated in Appendix L)												272.8907	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1068 * 1.00) =										-683.5651		-683.5651	(233)
Total delivered energy for all uses												3390.3561	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2118.3631	3.4800	73.7190	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1566.2947	3.4800	54.5071	(247)
Mechanical ventilation fans	41.3728	13.1900	5.4571	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	272.8907	13.1900	35.9943	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-683.5651	13.1900	-90.1622	(252)
Total energy cost			209.4077	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8427	(257)
SAP value		88.2445	
SAP rating (Section 12)		88	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2118.3631	0.2160	457.5664	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1566.2947	0.2160	338.3197	(264)
Space and water heating			795.8861	(265)
Pumps and fans	116.3728	0.5190	60.3975	(267)
Energy for lighting	272.8907	0.5190	141.6303	(268)
Energy saving/generation technologies				
PV Unit	-683.5651	0.5190	-354.7703	(269)
Total kg/year			643.1435	(272)
CO2 emissions per m2			10.8300	(273)
EI value			91.7427	
EI rating			92	(274)
EI band			A	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, 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	$3.48 / 0.8157 = 4.266$, stars = 4
Water heating environmental impact	$0.216 / 0.8157 = 0.2648$, 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	59.3700 (1b)	x 2.4000 (2b)	= 142.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4880 (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							0 * 10 =	0.0000	(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) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							2.1500					
Infiltration rate							0.1075	(18)				
Number of sides sheltered							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.0994	(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
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
Mechanical extract ventilation - centralised	0.1168	0.1094	0.1094	0.0994	0.1019	0.0970	0.0970	0.0945	0.0945	0.1019	0.0994	0.1019
If mechanical ventilation:												0.5000
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

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)			11.4300	1.1450	13.0878			(27)
Ground Floor			59.3700	0.1200	7.1244	84.0000	4987.0800	(28a)
Brick and Block	58.7500	13.5800	45.1700	0.2500	11.2925	68.2600	3083.3042	(29a)
Pitched Roof	1.4900		1.4900	0.1000	0.1490	9.1000	13.5590	(30)
Total net area of external elements Aum(A, m2)			119.6100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.0187			(33)
Party Wall 1			14.2300	0.0000	0.0000	58.0600	826.1938	(32)
Party Wall 2			13.2500	0.0000	0.0000	58.0600	769.2950	(32)
Party Ceilings 1			58.1100			70.0000	4067.7000	(32b)
Ground Floor Block			31.6800			75.0000	2376.0000	(32c)
Ground Floor Stud			72.8200			9.0000	655.3800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16778.5120	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							282.6093	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5036	(36)
Total fabric heat loss						(33) + (36) =	47.5223	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9638 (42)
Average daily hot water use (litres/day)												80.8395 (43)
Daily hot water use	Jan 88.9234	Feb 85.6898	Mar 82.4562	Apr 79.2227	May 75.9891	Jun 72.7555	Jul 72.7555	Aug 75.9891	Sep 79.2227	Oct 82.4562	Nov 85.6898	Dec 88.9234 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	131.8708	115.3351	119.0155	103.7606	99.5607	85.9133	79.6113	91.3552	92.4462	107.7372	117.6036	127.7099 (45)
Energy content (annual)										Total =	Sum(45)m =	1271.9194 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.7806	17.3003	17.8523	15.5641	14.9341	12.8870	11.9417	13.7033	13.8669	16.1606	17.6405	19.1565 (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	1.3485	1.1365	1.1286	0.9453	0.8700	0.7188	0.6661	0.7983	0.8422	1.0216	1.1589	1.3060 (61)
Total heat required for water heating calculated for each month												
	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158 (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)
								Solar input (sum of months) =	Sum(63)m =			0.0000 (63)
Output from w/h												
	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) =	Sum(64)m =			1283.8604 (64)
	44.1842	38.6330	39.8548	34.7367	33.3215	28.7459	26.6373	30.5752	30.9489	36.0780	39.3929	42.7900 (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	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260	117.8260 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	38.6305	34.3113	27.9038	21.1250	15.7912	13.3316	14.4052	18.7245	25.1319	31.9108	37.2446	39.7042 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	255.7542	258.4081	251.7203	237.4827	219.5104	202.6189	191.3343	188.6804	195.3682	209.6058	227.5781	244.4696 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464	48.7464 (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)												
	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507	-78.5507 (71)
Water heating gains (Table 5)												
	59.3873	57.4897	53.5683	48.2454	44.7869	39.9249	35.8028	41.0957	42.9846	48.4920	54.7124	57.5135 (72)
Total internal gains												
	444.7937	441.2307	424.2140	397.8748	371.1101	346.8970	332.5641	339.5222	354.5065	381.0302	410.5568	432.7090 (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		
East				2.8800	25.1733	0.6300	0.7000	0.7700		22.1566 (76)		
South				3.0000	56.5862	0.6300	0.7000	0.7700		51.8804 (78)		
West				5.5500	25.1733	0.6300	0.7000	0.7700		42.6977 (80)		
Solar gains	116.7347	179.9790	273.5622	368.8257	406.6793	453.5657	417.5449	386.5529	321.1156	221.8008	141.8280	92.9673 (83)
Total gains	561.5285	621.2097	697.7762	766.7005	777.7894	800.4627	750.1089	726.0751	675.6221	602.8310	552.3848	525.6762 (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	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133	65.6133
alpha	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742	5.3742
util living area												
	0.9863	0.9763	0.9416	0.8472	0.6818	0.4491	0.3121	0.3126	0.5742	0.8625	0.9680	0.9895 (86)
MIT	20.2314	20.3468	20.5805	20.8226	20.9560	20.9960	20.9996	20.9996	20.9860	20.8402	20.5075	20.1936 (87)
Th 2	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228	19.9228 (88)
util rest of house												
	0.9812	0.9678	0.9215	0.8008	0.6037	0.3561	0.2105	0.2076	0.4709	0.8069	0.9542	0.9854 (89)
MIT 2	19.2591	19.3710	19.5922	19.8037	19.9013	19.9218	19.9228	19.9228	19.9184	19.8243	19.5284	19.2223 (90)
Living area fraction									fLA =	Living area / (4) =		0.4054 (91)
MIT	19.6533	19.7666	19.9929	20.2168	20.3289	20.3573	20.3593	20.3594	20.3512	20.2362	19.9253	19.6161 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6533	19.7666	19.9929	20.2168	20.3289	20.3573	20.3593	20.3594	20.3512	20.2362	19.9253	19.6161 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9796	0.9663	0.9230	0.8146	0.6343	0.3939	0.2517	0.2503	0.5130	0.8248	0.9543	0.9840 (94)
Useful gains	550.0802	600.2675	644.0610	624.5423	493.3280	315.3023	188.8154	181.7182	346.5717	497.2186	527.1324	517.2611 (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												
	998.2451	977.8804	880.3020	718.6214	513.4916	316.6154	188.9009	181.7980	351.7000	577.9337	804.4699	988.4992 (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												
	333.4347	253.7559	175.7633	67.7369	15.0017	0.0000	0.0000	0.0000	0.0000	60.0520	199.6830	350.6011 (98)
Space heating												1456.0287 (98)
Space heating per m2										(98) / (4) =		24.5247 (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													1614.2226 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	333.4347	253.7559	175.7633	67.7369	15.0017	0.0000	0.0000	0.0000	0.0000	60.0520	199.6830	350.6011	(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)	369.6615	281.3258	194.8596	75.0964	16.6316	0.0000	0.0000	0.0000	0.0000	66.5765	221.3781	388.6931	(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	133.2194	116.4716	120.1440	104.7059	100.4308	86.6322	80.2774	92.1535	93.2885	108.7588	118.7625	129.0158	(64)
Efficiency of water heater (217)m	85.7048	85.2714	83.9385	81.1474	77.7687	76.2000	76.2000	76.2000	76.2000	80.6532	84.4158	76.2000	(216)
Fuel for water heating, kWh/month	155.4398	136.5894	143.1334	129.0317	129.1403	113.6905	105.3510	120.9364	122.4258	134.8475	140.6874	150.1021	(219)
Water heating fuel used												1581.3755	(219)
Annual totals kWh/year													
Space heating fuel - main system												1614.2226	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.2380)													
mechanical ventilation fans (SFP = 0.2380)												41.3728	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												116.3728	(231)
Electricity for lighting (calculated in Appendix L)												272.8907	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 1184 * 1.00) =											-757.7068	-757.7068	(233)
Total delivered energy for all uses												2827.1547	(238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1614.2226	7.6100	122.8423 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1581.3755	7.6100	120.3427 (247)
Mechanical ventilation fans	41.3728	31.0800	12.8587 (249)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	272.8907	31.0800	84.8144 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-757.7068	31.0800	-235.4953 (252)
Total energy cost			233.6728 (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	1614.2226	0.2160	348.6721 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1581.3755	0.2160	341.5771 (264)
Space and water heating			690.2492 (265)
Pumps and fans	116.3728	0.5190	60.3975 (267)
Energy for lighting	272.8907	0.5190	141.6303 (268)
Energy saving/generation technologies			
PV Unit	-757.7068	0.5190	-393.2498 (269)
Total kg/year			499.0271 (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	1614.2226	1.2200	1969.3515 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1581.3755	1.2200	1929.2781 (264)
Space and water heating			3898.6296 (265)
Pumps and fans	116.3728	3.0700	357.2645 (267)
Energy for lighting	272.8907	3.0700	837.7744 (268)
Energy saving/generation technologies			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

PV Unit	-757.7068	3.0700	-2326.1600 (269)
Primary energy kWh/year			2767.5085 (272)
Primary energy kWh/m2/year			46.6146 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 92

(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	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
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: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	A 92

Fuel prices for cost data on this page from database revision number 542 TEST (30 Apr 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	£121	£121	£0
Mains gas	£348	£348	£0
Space heating	£264	£264	£0
Water heating	£120	£120	£0
Lighting	£85	£85	£0
Generated (PV)	-£235	-£235	£0
Total cost of fuels	£234	£234	£0
Total cost of uses	£234	£234	£0
Delivered energy	48 kWh/m²	48 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	47 kWh/m²	47 kWh/m²	0 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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

No improvements selected / applicable

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 27	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	28, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.00	TER	19.70
Environmental	92 A	% DER<TER	34.01		
CO ₂ Emissions (t/year)	0.50	DFEE	46.69	TFEE	52.16
General Requirements Compliance	Pass	% DFEE<TFEE	10.50		

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 27	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	28, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.00	TER	19.70
Environmental	92 A	% DER<TER	34.01		
CO ₂ Emissions (t/year)	0.50	DFEE	46.69	TFEE	52.16
General Requirements Compliance	Pass	% DFEE<TFEE	10.50		

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	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 4	Supabloc *7						
	Main construction	100	0.1900	0.5263	94.04	680	1000
	Main construction	100	0.8803	0.1136	5.96	680	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 3.968 m ² K/W	Lower limit = 3.901 m ² K/W	Average = 3.935 m ² K/W
	Total correction = 0.0001 m ² K/W	U-value (unrounded) = 0.25 W/m ² K	

Unheated space: None		
Total thickness: 330 mm	U-value: 0.25 W/m² K	Kappa: 68.26 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 27	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	28, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.00	TER	19.70
Environmental	92 A	% DER<TER	34.01		
CO ₂ Emissions (t/year)	0.50	DFEE	46.69	TFEE	52.16
General Requirements Compliance	Pass	% DFEE<TFEE	10.50		

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 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 27	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Property	28, Shaw Crescent, West End, Southampton, SO30 3LH		
SAP Rating	88 B	DER	13.00
Environmental	92 A	TER	19.70
CO ₂ Emissions (t/year)	0.50	% DER<TER	34.01
General Requirements Compliance	Pass	DFEE	46.69
		TFEE	52.16
		% DFEE<TFEE	10.50
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	South						
Property Tenure	Unknown						
Transaction Type	New dwelling						
Terrain Type	Suburban						
1.0 Property Type	Maisonette, Semi-Detached						
2.0 Number of Storeys	1						
3.0 Date Built	2023						
4.0 Sheltered Sides	1						
5.0 Sunlight/Shade	Average or unknown						
6.0 Measurements							
Ground Floor:		Heat Loss Perimeter		Internal Floor Area		Average Storey Height	
		24.48 m		59.37 m ²		2.40 m	
7.0 Living Area	24.07			m ²			
8.0 Thermal Mass Parameter	Precise calculation						
Thermal Mass	282.61			kJ/m ² K			
9.0 External Walls							
Description	Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Brick and Block	Cavity Wall	Other		0.25	68.26	58.75	45.17
9.1 Party Walls							
Description	Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
Party Wall 1	Filled Cavity with Edge Sealing	Other		0.00	58.06	14.23	
Party Wall 2	Filled Cavity with Edge Sealing	Other		0.00	58.06	13.25	
9.2 Internal Walls							
Description	Construction				Kappa (kJ/m ² K)	Area (m ²)	
Ground Floor Block	Dense block, plasterboard on dabs				75.00	31.68	
Ground Floor Stud	Plasterboard on timber frame				9.00	72.82	
10.0 External Roofs							
Description	Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Roof	External Plane Roof	Other		0.10	9.10	1.49	1.49

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceilings 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	58.11

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	59.37

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	Manufacture	Solid Door							1.10
Windows	Manufacture	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	South							2.15	
Front Elevation	Window	[1] Brick and Block	South	None	0.00					3.00	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					2.88	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					5.55	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.37	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	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	E2 Other lintels (including other steel lintels)	1.81	0.061	No	Birtley Supatherm
Independently assessed	E3 Sill	6.92	0.020	No	Knauf P5
Independently assessed	E4 Jamb	22.20	0.015	No	Knauf P6
Table K1 - Default	E5 Ground floor (normal)	24.48	0.320	No	
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	24.48	0.070	No	
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	1.80	0.060	No	
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	1.60	0.240	No	
Independently assessed	E12 Gable (insulation at ceiling level)	1.60	0.056	No	Knauf P21
Independently assessed	E16 Corner (normal)	12.00	0.048	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.80	-0.102	No	Knauf P24
Independently assessed	E18 Party wall between dwellings	2.60	0.026	No	Knauf P25/3
Independently assessed	E25 Staggered party wall between dwellings	4.80	0.062	No	Knauf P27 Halved
Table K1 - Default	P1 Party wall - Ground floor	11.36	0.160	No	
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.44	0.000	No	

Y-value	0.113	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	Yes	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	2.15	m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	1
Manufacturer SFP	0.17
Duct Type	Rigid
Wet Rooms	1

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	14	
Total number of L.E.L. fittings	14	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17959	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.2	
Controls	76.2	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
	Balanced	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Fan Assisted Flue	Yes			
Is MHS Pumped	Pump in heated space			
Heat Emitter	Radiators			
Flow Temperature	Normal (> 45°C)			
Combi boiler type	Standard Combi			
Combi keep hot type	None			

25.0 Main Heating 2	None			
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Community Heating	None			
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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	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None