



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 18, Shaw Crescent
West End, Southampton, SO30 3LH

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

Report Issue Date: 28/05/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 22			Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J		
Property	18, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	86 B	DER	16.29	TER	20.26
Environmental	89 B	% DER<TER	19.58		
CO ₂ Emissions (t/year)	0.69	DFEE	49.40	TFEE	55.07
General Requirements Compliance	Pass	% DFEE<TFEE	10.30		
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)	20.26	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.29	kgCO ₂ /m ²	Pass
	-3.97 (-19.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.07	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	49.40	kWh/m ² /yr	
	-5.7 (-10.3%)	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	2.53 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.17

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

3.00 m², No overhang

Windows facing East

2.89 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

2.53 (measured in this dwelling)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

10 Key features

Party wall U-value	0.00	W/m ² K
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	2.5	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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Assessment Reference	As Built	Prop Type Ref	Block J
Property	18, Shaw Crescent, West End, Southampton, SO30 3LH		

SAP Rating	86 B	DER	16.29	TER	20.26
Environmental	89 B	% DER<TER	19.58		
CO ₂ Emissions (t/year)	0.69	DFEE	49.40	TFEE	55.07
General Requirements Compliance	Pass	% DFEE<TFEE	10.30		

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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	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	1.94	0.12	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	0.240	1.64	0.39	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.056	1.64	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	2.40	0.06	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	11.33	1.81	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	11.33	0.00	

Total: **13.51** W/mK:
Y-Value: **0.113** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Semi-Detached 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) 20.26 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.29 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)49.4 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:	2.53 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

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

Data from database

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

Combi boiler

Efficiency: 89.3% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system

Specific fan power:	0.17	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:	Average
Windows facing North:	3.00 m ² , No overhang
Windows facing East:	2.89 m ² , No overhang
Windows facing West:	5.55 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

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	2.5 m ³ /m ² h
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 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					2.5300
Infiltration rate					0.1265 (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) =				0.1170 (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	0.1492	0.1463	0.1433	0.1287	0.1258	0.1112	0.1112	0.1082	0.1170	0.1258	0.1316	0.1375 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												
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)			11.4400	1.1450	13.0992		(27)
Ground Floor			59.3700	0.1200	7.1244	84.0000	4987.0800 (28a)
Brick and Block	58.7500	13.5900	45.1600	0.2500	11.2900	58.0600	2621.9896 (29a)
Pitched Roof	1.4400		1.4400	0.1000	0.1440	9.1000	13.1040 (30)
Total net area of external elements Aum(A, m ²)			119.5600				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	34.0226			
Party Wall 1			14.2300	0.0000	0.0000	58.0600	826.1938 (32)
Party Wall 2			13.2400	0.0000	0.0000	58.0600	768.7144 (32)
Party Ceilings 1			57.7600			70.0000	4043.2000 (32b)
Ground Floor Block			30.5300			75.0000	2289.7500 (32c)
Ground Floor Stud			81.3100			9.0000	731.7900 (32c)
Internal Ceiling 1			57.9300			0.0000	0.0000 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	16281.8218 (34)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K				274.2433 (35)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				13.5139 (36)			
Total fabric heat loss			(33) + (36) =	47.5365 (37)			

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 23.5105	Feb 23.5105	Mar 23.5105	Apr 23.5105	May 23.5105	Jun 23.5105	Jul 23.5105	Aug 23.5105	Sep 23.5105	Oct 23.5105	Nov 23.5105	Dec 23.5105 (38)
Heat transfer coeff	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470 (39)
Average = Sum(39)m / 12 =												
HLP	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967 (40)
HLP (average)												
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	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 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										Total = Sum (45)m =		1271.9194 (45)
	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)
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	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)
										Total per year (kWh/year) = Sum (64)m =		1283.8604 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	15.4505	13.7230	11.1603	8.4491	6.3158	5.3320	5.7615	7.4890	10.0517	12.7629	14.8962	15.8799 (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	301.6496	299.8026	288.8376	271.2644	253.6311	236.4680	225.2148	230.4570	239.3895	257.1472	277.5424	292.6445 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				3.0000	10.6334	0.6300	0.7000	0.7700		9.7491 (74)		
East				2.8900	19.6403	0.6300	0.7000	0.7700		17.3467 (76)		
West				5.5500	19.6403	0.6300	0.7000	0.7700		33.3129 (80)		
Solar gains	60.4087	117.7319	194.8637	288.8768	360.2106	371.9491	352.7605	298.5237	227.8782	139.7694	75.1933	49.7873 (83)
Total gains	362.0583	417.5345	483.7014	560.1412	613.8417	608.4172	577.9752	528.9807	467.2677	396.9166	352.7357	342.4318 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583
util living area	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439
	0.9986	0.9968	0.9898	0.9604	0.8691	0.6984	0.5308	0.5979	0.8593	0.9818	0.9971	0.9990 (86)
MIT	19.7975	19.9393	20.1962	20.5310	20.8145	20.9566	20.9915	20.9847	20.8707	20.4910	20.0731	19.7587 (87)
Th 2	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227 (88)
util rest of house	0.9981	0.9956	0.9858	0.9440	0.8184	0.6011	0.4062	0.4682	0.7847	0.9715	0.9958	0.9986 (89)
MIT 2	18.8314	18.9727	19.2276	19.5518	19.8033	19.9045	19.9208	19.9188	19.8541	19.5192	19.1067	18.7928 (90)
Living area fraction									fLA = Living area / (4) =			0.3412 (91)
MIT	19.1611	19.3026	19.5581	19.8860	20.1484	20.2635	20.2862	20.2825	20.2010	19.8508	19.4365	19.1224 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1611	19.3026	19.5581	19.8860	20.1484	20.2635	20.2862	20.2825	20.2010	19.8508	19.4365	19.1224 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9976	0.9946	0.9840	0.9433	0.8303	0.6336	0.4492	0.5131	0.8067	0.9706	0.9949	0.9982 (94)
Ext temp.	361.1884	415.2793	475.9594	528.3732	509.6615	385.5141	259.6192	271.4249	376.9518	385.2491	350.9473	341.8127 (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	1055.8368	1023.2591	927.7409	780.5222	600.2328	402.3760	261.8908	275.8430	433.4584	657.2451	876.4685	1060.1922 (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	516.8184	408.5624	336.1254	181.5473	67.3850	0.0000	0.0000	0.0000	0.0000	202.3650	378.3753	534.4743 (98)
Space heating per m2												2625.6532 (98)
										(98) / (4) =		44.2253 (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													2910.9237 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	516.8184	408.5624	336.1254	181.5473	67.3850	0.0000	0.0000	0.0000	0.0000	202.3650	378.3753	534.4743	(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)	572.9694	452.9517	372.6446	201.2719	74.7062	0.0000	0.0000	0.0000	0.0000	224.3514	419.4848	592.5436	(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	86.9269	86.6677	86.0376	84.5199	81.2647	76.2000	76.2000	76.2000	76.2000	84.7565	86.4075	87.0887	(217)
Fuel for water heating, kWh/month	153.2544	134.3888	139.6413	123.8831	123.5847	113.6905	105.3510	120.9364	122.4258	128.3191	137.4447	148.1431	(219)
Water heating fuel used												1551.0628	(219)
Annual totals kWh/year													
Space heating fuel - main system												2910.9237	(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)													272.8604 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 + 0.80 + 597 + 1.00) =										-382.3114			-382.3114 (233)
Total delivered energy for all uses													4468.9084 (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	2910.9237	0.2160	628.7595 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1551.0628	0.2160	335.0296 (264)
Space and water heating			963.7891 (265)
Pumps and fans	116.3728	0.5190	60.3975 (267)
Energy for lighting	272.8604	0.5190	141.6146 (268)
Energy saving/generation technologies			
PV Unit	-382.3114	0.5190	-198.4196 (269)
Total CO2, kg/year			967.3815 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.2900 (273)

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

DER		16.2900	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		36.1914	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		36.1914	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	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
Pressure test					20.0000 / (5) = 0.1404 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3904 (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) =				0.3611 (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)			11.4400	1.3258	15.1667		(27)
Ground Floor			59.3700	0.1300	7.7181		(28a)
Brick and Block	58.7500	13.5900	45.1600	0.1800	8.1288		(29a)
Pitched Roof	1.4400		1.4400	0.1300	0.1872		(30)
Total net area of external elements Aum(A, m ²)			119.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.3508		(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)							10.1577 (36)
Total fabric heat loss						(33) + (36) =	43.5085 (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	72.0021	71.8086	71.6190	70.7281	70.5614	69.7855	69.7855	69.6418	70.0844	70.5614	70.8986	71.2511 (39)
Average = Sum(39)m / 12 =												70.7273 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2128	1.2095	1.2063	1.1913	1.1885	1.1754	1.1754	1.1730	1.1805	1.1885	1.1942	1.2001 (40)
HLP (average)												1.1913 (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	15.4505	13.7230	11.1603	8.4491	6.3158	5.3320	5.7615	7.4890	10.0517	12.7629	14.8962	15.8799 (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	316.4231	314.0527	302.5776	284.5017	266.3506	248.6766	237.4491	243.2006	252.6626	270.9231	291.8129	307.4323 (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
North	3.0000	10.6334	0.6300		0.7000	0.7700	9.7491 (74)
East	2.8900	19.6403	0.6300		0.7000	0.7700	17.3467 (76)
West	5.5500	19.6403	0.6300		0.7000	0.7700	33.3129 (80)

Solar gains	60.4087	117.7319	194.8637	288.8768	360.2106	371.9491	352.7605	298.5237	227.8782	139.7694	75.1933	49.7873 (83)
Total gains	376.8318	431.7846	497.4414	573.3785	626.5612	620.6257	590.2095	541.7243	480.5408	410.6925	367.0062	357.2196 (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	57.2610	57.4153	57.5674	58.2925	58.4302	59.0799	59.0799	59.2018	58.8279	58.4302	58.1523	57.8646
alpha	4.8174	4.8277	4.8378	4.8862	4.8953	4.9387	4.9387	4.9468	4.9219	4.8953	4.8768	4.8576
util living area	0.9974	0.9946	0.9850	0.9485	0.8490	0.6733	0.5101	0.5726	0.8337	0.9734	0.9949	0.9980 (86)
MIT	19.7072	19.8628	20.1412	20.5102	20.8048	20.9548	20.9906	20.9840	20.8695	20.4752	20.0265	19.6825 (87)
Th 2	19.9098	19.9124	19.9150	19.9270	19.9292	19.9397	19.9397	19.9417	19.9357	19.9292	19.9247	19.9199 (88)
util rest of house	0.9966	0.9927	0.9796	0.9296	0.7973	0.5801	0.3924	0.4502	0.7579	0.9602	0.9928	0.9974 (89)
MIT 2	18.1954	18.4240	18.8291	19.3592	19.7426	19.9107	19.9364	19.9353	19.8325	19.3219	18.6723	18.1663 (90)
Living area fraction									fLA = Living area / (4) =			0.3412 (91)
MIT	18.7113	18.9150	19.2768	19.7520	20.1051	20.2670	20.2961	20.2931	20.1864	19.7155	19.1344	18.6837 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7113	18.9150	19.2768	19.7520	20.1051	20.2670	20.2961	20.2931	20.1864	19.7155	19.1344	18.6837 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9951	0.9903	0.9754	0.9258	0.8068	0.6104	0.4329	0.4922	0.7781	0.9567	0.9906	0.9962 (94)
Ext temp.	375.0029	427.6079	485.1950	530.8544	505.5011	378.8307	255.4832	266.6392	373.9036	392.9163	363.5652	355.8669 (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	1037.6467	1006.3978	915.0640	767.5378	593.0741	395.4711	257.9367	271.1247	426.5601	643.2031	853.2242	1031.9789 (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	493.0070	388.9468	319.8225	170.4121	65.1543	0.0000	0.0000	0.0000	0.0000	186.2134	352.5545	503.0273 (98)
Space heating per m2												2479.1379 (98)
										(98) / (4) =		41.7574 (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													2654.3232 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	493.0070	388.9468	319.8225	170.4121	65.1543	0.0000	0.0000	0.0000	0.0000	186.2134	352.5545	503.0273	(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)	527.8447	416.4313	342.4224	182.4540	69.7584	0.0000	0.0000	0.0000	0.0000	199.3719	377.4673	538.5731	(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	87.4907	87.2752	86.7461	85.4966	83.2799	80.3000	80.3000	80.3000	80.3000	85.6008	86.9867	87.5807	(217)
Fuel for water heating, kWh/month	202.5190	177.3423	185.6386	167.0583	166.0472	151.6722	145.3135	161.9905	163.7795	174.9469	183.7771	197.5598	(219)
Water heating fuel used												2077.6451	(219)
Annual totals kWh/year													
Space heating fuel - main system												2654.3232	(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)												272.8604	(232)
Total delivered energy for all uses												5079.8287	(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	2654.3232	0.2160	573.3338 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2077.6451	0.2160	448.7713 (264)
Space and water heating			1022.1052 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	272.8604	0.5190	141.6146 (268)
Total CO2, kg/m2/year			1202.6447 (272)
Emissions per m2 for space and water heating			17.2159 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3853 (272b)
Emissions per m2 for pumps and fans			0.6556 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.2159 * 1.00) + 2.3853 + 0.6556, rounded to 2 d.p.			20.2600 (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					2.5300
Number of sides sheltered					0.2669 (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) =				0.2468 (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	0.3147	0.3086	0.3024	0.2715	0.2654	0.2345	0.2345	0.2283	0.2468	0.2654	0.2777	0.2900 (22b)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421 (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)			11.4400	1.1450	13.0992		(27)
Ground Floor			59.3700	0.1200	7.1244	84.0000	4987.0800 (28a)
Brick and Block	58.7500	13.5900	45.1600	0.2500	11.2900	58.0600	2621.9896 (29a)
Pitched Roof	1.4400		1.4400	0.1000	0.1440	9.1000	13.1040 (30)
Total net area of external elements Aum(A, m ²)			119.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.0226		(33)
Party Wall 1			14.2300	0.0000	0.0000	58.0600	826.1938 (32)
Party Wall 2			13.2400	0.0000	0.0000	58.0600	768.7144 (32)
Party Ceilings 1			57.7600			30.0000	1732.8000 (32b)
Ground Floor Block			30.5300			75.0000	2289.7500 (32c)
Ground Floor Stud			81.3100			9.0000	731.7900 (32c)
Internal Ceiling 1			57.9300			0.0000	0.0000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) =	13971.4218 (34)
	235.3280 (35)
	13.5139 (36)
(33) + (36) =	47.5365 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 25.8394 Feb 25.7489 Mar 25.6603 Apr 25.2440 May 25.1661 Jun 24.8034 Jul 24.8034 Aug 24.7363 Sep 24.9431 Oct 25.1661 Nov 25.3236 Dec 25.4884 (38)
Heat transfer coeff	73.3759 73.2854 73.1968 72.7804 72.7025 72.3399 72.3399 72.2728 72.4796 72.7025 72.8601 73.0249 (39)
Average = Sum(39)m / 12 =	72.7801 (39)

HLP	Jan 1.2359 Feb 1.2344 Mar 1.2329 Apr 1.2259 May 1.2246 Jun 1.2185 Jul 1.2185 Aug 1.2173 Sep 1.2208 Oct 1.2246 Nov 1.2272 Dec 1.2300 (40)
HLP (average)	1.2259 (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 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)
	Total = Sum(45)m =											1271.9194 (45)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	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	15.4505	13.7230	11.1603	8.4491	6.3158	5.3320	5.7615	7.4890	10.0517	12.7629	14.8962	15.8799	(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	276.9270	275.7842	266.2624	250.6428	234.2806	218.8995	209.1504	212.4540	220.6893	236.4270	254.5394	268.6073	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North					3.0000	10.6334	0.6300	0.7000	0.7700		9.7491 (74)		
East					2.8900	19.6403	0.6300	0.7000	0.7700		17.3467 (76)		
West					5.5500	19.6403	0.6300	0.7000	0.7700		33.3129 (80)		
Solar gains	60.4087	117.7319	194.8637	288.8768	360.2106	371.9491	352.7605	298.5237	227.8782	139.7694	75.1933	49.7873	(83)
Total gains	337.3357	393.5161	461.1261	539.5196	594.4912	590.8487	561.9109	510.9778	448.5676	376.1963	329.7327	318.3946	(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	52.8914	52.9566	53.0208	53.3241	53.3812	53.6488	53.6488	53.6987	53.5454	53.3812	53.2658	53.1456	
alpha	4.5261	4.5304	4.5347	4.5549	4.5587	4.5766	4.5766	4.5799	4.5697	4.5587	4.5511	4.5430	
util living area	0.9979	0.9954	0.9870	0.9555	0.8686	0.7089	0.5474	0.6157	0.8620	0.9787	0.9959	0.9984	(86)
MIT	19.5495	19.7132	20.0100	20.4030	20.7387	20.9277	20.9825	20.9708	20.8143	20.3655	19.8812	19.5149	(87)
Th 2	19.8914	19.8926	19.8938	19.8994	19.9004	19.9053	19.9053	19.9062	19.9034	19.9004	19.8983	19.8961	(88)
util rest of house	0.9972	0.9939	0.9824	0.9392	0.8213	0.6148	0.4206	0.4856	0.7931	0.9681	0.9943	0.9979	(89)
MIT 2	18.5733	18.7373	19.0326	19.4189	19.7238	19.8717	19.9007	19.8976	19.7972	19.3902	18.9099	18.5424	(90)
Living area fraction	18.9064	19.0704	19.3661	19.7547	20.0701	20.2320	20.2699	20.2638	20.1443	19.7230	19.2413	18.8743	(91)
MIT	18.9064	19.0704	19.3661	19.7547	20.0701	20.2320	20.2699	20.2638	20.1443	19.7230	19.2413	18.8743	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9064	19.0704	19.3661	19.7547	20.0701	20.2320	20.2699	20.2638	20.1443	19.7230	19.2413	18.8743	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9963	0.9923	0.9796	0.9366	0.8295	0.6449	0.4643	0.5304	0.8106	0.9659	0.9929	0.9972	(94)
Ext temp.	336.0986	390.4903	451.7114	505.2920	493.1545	381.0202	260.8795	271.0076	363.6207	363.3732	327.4053	317.4912	(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	1071.7573	1038.4819	941.7603	790.0098	608.5312	407.4213	265.4785	279.2475	438.0894	663.2673	884.6201	1071.5878	(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	547.3301	435.4503	364.5964	204.9968	85.8402	0.0000	0.0000	0.0000	0.0000	223.1212	401.1947	561.0479	(98)
Space heating per m2												2823.5776	(98)
												47.5590	(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	679.9952	535.3154	549.2730	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8650	0.9212	0.8919	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	588.1813	493.1461	489.9161	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	764.0728	728.8155	670.4410	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	126.6418	175.3381	134.3106	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												436.2905 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.6605	43.8345	33.5776	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												109.0726 (107)
Space cooling per m2												1.8372 (108)
Energy for space heating												47.5590 (99)
Energy for space cooling												1.8372 (108)
Total												49.3962 (109)
Dwelling Fabric Energy Efficiency (DFEE)												49.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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
Pressure test					20.0000 / (5) = 0.1404 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3904 (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) =	0.3611 (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)			11.4400	1.3258	15.1667		(27)
Ground Floor			59.3700	0.1300	7.7181		(28a)
Brick and Block	58.7500	13.5900	45.1600	0.1800	8.1288		(29a)
Pitched Roof	1.4400		1.4400	0.1300	0.1872		(30)
Total net area of external elements Aum(A, m ²)			119.5600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	33.3508	(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)							10.1577 (36)
Total fabric heat loss						(33) + (36) =	43.5085 (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	72.0021	71.8086	71.6190	70.7281	70.5614	69.7855	69.7855	69.6418	70.0844	70.5614	70.8986	71.2511 (39)
Average = Sum(39)m / 12 =												70.7273 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2128	1.2095	1.2063	1.1913	1.1885	1.1754	1.1754	1.1730	1.1805	1.1885	1.1942	1.2001 (40)
HLP (average)												1.1913 (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)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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	15.4505	13.7230	11.1603	8.4491	6.3158	5.3320	5.7615	7.4890	10.0517	12.7629	14.8962	15.8799	(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	276.9270	275.7842	266.2624	250.6428	234.2806	218.8995	209.1504	212.4540	220.6893	236.4270	254.5394	268.6073	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.0000	10.6334	0.6300	0.7000	0.7700	9.7491	(74)
East	2.8900	19.6403	0.6300	0.7000	0.7700	17.3467	(76)
West	5.5500	19.6403	0.6300	0.7000	0.7700	33.3129	(80)

Solar gains	60.4087	117.7319	194.8637	288.8768	360.2106	371.9491	352.7605	298.5237	227.8782	139.7694	75.1933	49.7873	(83)
Total gains	337.3357	393.5161	461.1261	539.5196	594.4912	590.8487	561.9109	510.9778	448.5676	376.1963	329.7327	318.3946	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	57.2610	57.4153	57.5674	58.2925	58.4302	59.0799	59.0799	59.2018	58.8279	58.4302	58.1523	57.8646	
alpha	4.8174	4.8277	4.8378	4.8862	4.8953	4.9387	4.9387	4.9468	4.9219	4.8953	4.8768	4.8576	
util living area	0.9984	0.9964	0.9890	0.9585	0.8686	0.6987	0.5336	0.6022	0.8608	0.9811	0.9968	0.9988	(86)
MIT	19.6462	19.8044	20.0880	20.4682	20.7803	20.9468	20.9886	20.9801	20.8467	20.4270	19.9693	19.6221	(87)
Th 2	19.9098	19.9124	19.9150	19.9270	19.9292	19.9397	19.9397	19.9417	19.9357	19.9292	19.9247	19.9199	(88)
util rest of house	0.9979	0.9951	0.9849	0.9425	0.8205	0.6051	0.4116	0.4758	0.7906	0.9712	0.9955	0.9984	(89)
MIT 2	18.6784	18.8382	19.1217	19.5008	19.7833	19.9159	19.9369	19.9361	19.8501	19.4691	19.0129	18.6624	(90)
Living area fraction									fLA = Living area / (4) =			0.3412	(91)
MIT	19.0087	19.1679	19.4514	19.8309	20.1235	20.2677	20.2958	20.2924	20.1902	19.7960	19.3393	18.9899	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0087	19.1679	19.4514	19.8309	20.1235	20.2677	20.2958	20.2924	20.1902	19.7960	19.3393	18.9899	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9972	0.9939	0.9826	0.9408	0.8303	0.6358	0.4536	0.5194	0.8098	0.9696	0.9944	0.9979	(94)
Useful gains	336.4056	391.1180	453.1044	507.5683	493.6022	375.6789	254.9017	265.4094	363.2686	364.7741	327.9019	317.7306	(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	1059.0553	1024.5576	927.5687	773.1249	594.3749	395.5239	257.9128	271.0705	426.8281	648.8823	867.7471	1053.7989	(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	537.6514	425.6714	353.0015	191.2007	74.9749	0.0000	0.0000	0.0000	0.0000	211.3765	388.6885	547.6348	(98)
Space heating												2730.1998	(98)
Space heating per m2										(98) / (4) =		45.9862	(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	655.9835	516.4125	529.2776	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8882	0.9389	0.9134	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	582.6494	484.8826	483.4367	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	764.0728	728.8155	670.4410	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.6248	181.4861	139.1312	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												451.2421	(104)
Cooled fraction												1.0000	(105)
												fC = cooled area / (4) =	

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	32.6562	45.3715	34.7828	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											112.8105 (107)
Space cooling per m2											1.9001 (108)
Energy for space heating											45.9862 (99)
Energy for space cooling											1.9001 (108)
Total											47.8863 (109)
Target Fabric Energy Efficiency (TFEE)											55.1 (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		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							2.5300					
Infiltration rate							0.1265	(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) =	0.1170	(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	0.1375	0.1287	0.1287	0.1170	0.1199	0.1141	0.1141	0.1112	0.1112	0.1199	0.1170	0.1199
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 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)			11.4400	1.1450	13.0992		(27)
Ground Floor			59.3700	0.1200	7.1244	84.0000	4987.0800 (28a)
Brick and Block	58.7500	13.5900	45.1600	0.2500	11.2900	58.0600	2621.9896 (29a)
Pitched Roof	1.4400		1.4400	0.1000	0.1440	9.1000	13.1040 (30)
Total net area of external elements Aum(A, m ²)			119.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.0226		(33)
Party Wall 1			14.2300	0.0000	0.0000	58.0600	826.1938 (32)
Party Wall 2			13.2400	0.0000	0.0000	58.0600	768.7144 (32)
Party Ceilings 1			57.7600			70.0000	4043.2000 (32b)
Ground Floor Block			30.5300			75.0000	2289.7500 (32c)
Ground Floor Stud			81.3100			9.0000	731.7900 (32c)
Internal Ceiling 1			57.9300			0.0000	0.0000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 16281.8218 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							274.2433 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5139 (36)
Total fabric heat loss						(33) + (36) =	47.5365 (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	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470 (39)
Average = Sum(39)m / 12 =												71.0470 (39)
HLP	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967 (40)
HLP (average)												1.1967 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	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 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										Total = Sum (45)m =		1271.9194 (45)
	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)
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												
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	38.6262	34.3075	27.9007	21.1226	15.7894	13.3301	14.4036	18.7224	25.1291	31.9072	37.2404	39.6998 (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	444.7894	441.2269	424.2109	397.8725	371.1084	346.8955	332.5625	339.5201	354.5037	381.0266	410.5526	432.7046 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				3.0000	13.4684	0.6300	0.7000	0.7700		12.3484 (74)		
East				2.8900	25.1733	0.6300	0.7000	0.7700		22.2336 (76)		
West				5.5500	25.1733	0.6300	0.7000	0.7700		42.6977 (80)		
Solar gains	77.2796	128.3802	216.2183	320.7197	375.0085	427.7568	390.0676	345.4384	264.4044	164.4873	95.9341	60.2529 (83)
Total gains	522.0690	569.6071	640.4293	718.5922	746.1169	774.6523	722.6300	684.9585	618.9081	545.5139	506.4867	492.9574 (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	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583
alpha	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439
util living area	0.9891	0.9822	0.9553	0.8695	0.7019	0.4631	0.3238	0.3312	0.6187	0.8949	0.9759	0.9913 (86)
MIT	20.1578	20.2621	20.5040	20.7820	20.9452	20.9947	20.9994	20.9993	20.9782	20.7899	20.4363	20.1278 (87)
Th 2	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227 (88)
util rest of house	0.9851	0.9758	0.9393	0.8273	0.6242	0.3677	0.2185	0.2201	0.5110	0.8476	0.9653	0.9880 (89)
MIT 2	19.1890	19.2909	19.5233	19.7720	19.8950	19.9212	19.9226	19.9226	19.9153	19.7865	19.4627	19.1596 (90)
Living area fraction									fLA = Living area / (4) =			0.3412 (91)
MIT	19.5196	19.6223	19.8580	20.1166	20.2534	20.2876	20.2900	20.2900	20.2780	20.1289	19.7950	19.4900 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5196	19.6223	19.8580	20.1166	20.2534	20.2876	20.2900	20.2900	20.2780	20.1289	19.7950	19.4900 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9831	0.9735	0.9381	0.8357	0.6493	0.4004	0.2545	0.2581	0.5479	0.8580	0.9638	0.9863 (94)
Useful gains	513.2587	554.5132	600.8023	600.5560	484.4229	310.1440	183.9096	176.8005	339.0786	468.0452	488.1355	486.1844 (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	988.9442	967.8251	870.8930	711.6511	508.2254	311.7236	184.0148	176.9089	346.5680	570.4290	795.3682	979.7379 (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	353.9101	277.7456	200.9475	79.9885	17.7091	0.0000	0.0000	0.0000	0.0000	76.1736	221.2076	367.2038 (98)
Space heating												1594.8857 (98)
RHI space heating demand												1595 (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					2.5300
Infiltration rate					0.1265 (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) =				0.1170 (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	0.1492	0.1463	0.1433	0.1287	0.1258	0.1112	0.1112	0.1082	0.1170	0.1258	0.1316	0.1375 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												
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)			11.4400	1.1450	13.0992		(27)
Ground Floor			59.3700	0.1200	7.1244	84.0000	4987.0800 (28a)
Brick and Block	58.7500	13.5900	45.1600	0.2500	11.2900	58.0600	2621.9896 (29a)
Pitched Roof	1.4400		1.4400	0.1000	0.1440	9.1000	13.1040 (30)
Total net area of external elements Aum(A, m ²)			119.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			34.0226	(33)
Party Wall 1			14.2300	0.0000	0.0000	58.0600	826.1938 (32)
Party Wall 2			13.2400	0.0000	0.0000	58.0600	768.7144 (32)
Party Ceilings 1			57.7600			70.0000	4043.2000 (32b)
Ground Floor Block			30.5300			75.0000	2289.7500 (32c)
Ground Floor Stud			81.3100			9.0000	731.7900 (32c)
Internal Ceiling 1			57.9300			0.0000	0.0000 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =			16281.8218	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K						274.2433	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						13.5139	(36)
Total fabric heat loss			(33) + (36) =			47.5365	(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	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470 (39)
Average = Sum(39)m / 12 =												71.0470 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967 (40)
HLP (average)												1.1967 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	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 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										Total = Sum (45)m =		1271.9194 (45)
Water storage loss:	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)
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)
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	38.6262	34.3075	27.9007	21.1226	15.7894	13.3301	14.4036	18.7224	25.1291	31.9072	37.2404	39.6998 (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	444.7894	441.2269	424.2109	397.8725	371.1084	346.8955	332.5625	339.5201	354.5037	381.0266	410.5526	432.7046 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				3.0000	10.6334	0.6300	0.7000	0.7700		9.7491 (74)		
East				2.8900	19.6403	0.6300	0.7000	0.7700		17.3467 (76)		
West				5.5500	19.6403	0.6300	0.7000	0.7700		33.3129 (80)		
Solar gains	60.4087	117.7319	194.8637	288.8768	360.2106	371.9491	352.7605	298.5237	227.8782	139.7694	75.1933	49.7873 (83)
Total gains	505.1981	558.9588	619.0747	686.7493	731.3190	718.8446	685.3229	638.0439	582.3819	520.7960	485.7460	482.4919 (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	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583
alpha	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439
util living area	0.9934	0.9879	0.9712	0.9178	0.7944	0.6102	0.4521	0.5046	0.7598	0.9469	0.9875	0.9948 (86)
MIT	20.0020	20.1375	20.3747	20.6657	20.8837	20.9766	20.9959	20.9929	20.9305	20.6417	20.2597	19.9598 (87)
Th 2	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227 (88)
util rest of house	0.9912	0.9837	0.9610	0.8895	0.7332	0.5173	0.3436	0.3905	0.6715	0.9221	0.9824	0.9930 (89)
MIT 2	19.0346	19.1683	19.3997	19.6716	19.8527	19.9135	19.9218	19.9210	19.8897	19.6571	19.2903	18.9927 (90)
Living area fraction	19.3647	19.4991	19.7324	20.0108	20.2045	20.2763	20.2884	20.2868	20.2449	19.9931	19.6211	19.3227 (92)
MIT	19.3647	19.4991	19.7324	20.0108	20.2045	20.2763	20.2884	20.2868	20.2449	19.9931	19.6211	19.3227 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3647	19.4991	19.7324	20.0108	20.2045	20.2763	20.2884	20.2868	20.2449	19.9931	19.6211	19.3227 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	499.9457	548.6672	593.5544	612.7066	548.8094	394.4997	260.9975	274.1962	407.6744	481.2202	476.2945	478.4712 (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	1070.3037	1037.2192	940.1252	789.3899	604.2204	403.2825	262.0464	276.1458	436.5737	667.3542	889.5853	1074.4246 (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	424.3464	328.3070	257.8486	127.2120	41.2258	0.0000	0.0000	0.0000	0.0000	138.4837	297.5693	443.3893 (98)
Space heating												2058.3821 (98)
Space heating per m ²												34.6704 (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													2282.0201 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	424.3464	328.3070	257.8486	127.2120	41.2258	0.0000	0.0000	0.0000	0.0000	138.4837	297.5693	443.3893	(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)	470.4505	363.9767	285.8632	141.0332	45.7049	0.0000	0.0000	0.0000	0.0000	153.5296	329.8995	491.5624	(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	86.4069	86.0595	85.2232	83.2911	79.8048	76.2000	76.2000	76.2000	76.2000	83.4552	85.7081	86.6133	(216)
(217)m													(217)
Fuel for water heating, kWh/month	154.1768	135.3384	140.9757	125.7108	125.8455	113.6905	105.3510	120.9364	122.4258	130.3200	138.5663	148.9562	(219)
Water heating fuel used												1562.2933	(219)
Annual totals kWh/year													
Space heating fuel - main system												2282.0201	(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)												272.8604	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 597 * 1.00) =										-382.3114		-382.3114	(233)
Total delivered energy for all uses												3851.2352	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2282.0201	3.4800	79.4143 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1562.2933	3.4800	54.3678 (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	272.8604	13.1900	35.9903 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-382.3114	13.1900	-50.4269 (252)
Total energy cost			254.6951 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0249 (257)
SAP value	85.7022	
SAP rating (Section 12)	86	(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	2282.0201	0.2160	492.9163 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1562.2933	0.2160	337.4553 (264)
Space and water heating			830.3717 (265)
Pumps and fans	116.3728	0.5190	60.3975 (267)
Energy for lighting	272.8604	0.5190	141.6146 (268)
Energy saving/generation technologies			
PV Unit	-382.3114	0.5190	-198.4196 (269)
Total kg/year			833.9641 (272)
CO2 emissions per m2			14.0500 (273)
EI value			89.2928
EI rating			89
EI band			B

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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 $3.48 / 0.8178 = 4.255$, stars = 4
Water heating environmental impact $0.216 / 0.8178 = 0.2641$, 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 heating		secondary heating		other		total		m3 per hour			
Number of chimneys		0	+	0	+	0	=	0 * 40 =	0.0000 (6a)			
Number of open flues		0	+	0	+	0	=	0 * 20 =	0.0000 (6b)			
Number of intermittent fans								0 * 10 =	0.0000 (7a)			
Number of passive vents								0 * 10 =	0.0000 (7b)			
Number of flueless gas fires								0 * 40 =	0.0000 (7c)			
									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									2.5300			
Infiltration rate									0.1265 (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) =	0.1170 (21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate												
	0.1375	0.1287	0.1287	0.1170	0.1199	0.1141	0.1141	0.1112	0.1112	0.1199	0.1170	0.1199 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			11.4400	1.1450	13.0992		(27)
Ground Floor			59.3700	0.1200	7.1244	84.0000	4987.0800 (28a)
Brick and Block	58.7500	13.5900	45.1600	0.2500	11.2900	58.0600	2621.9896 (29a)
Pitched Roof	1.4400		1.4400	0.1000	0.1440	9.1000	13.1040 (30)
Total net area of external elements Aum(A, m ²)			119.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.0226		(33)
Party Wall 1			14.2300	0.0000	0.0000	58.0600	826.1938 (32)
Party Wall 2			13.2400	0.0000	0.0000	58.0600	768.7144 (32)
Party Ceilings 1			57.7600			70.0000	4043.2000 (32b)
Ground Floor Block			30.5300			75.0000	2289.7500 (32c)
Ground Floor Stud			81.3100			9.0000	731.7900 (32c)
Internal Ceiling 1			57.9300			0.0000	0.0000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 16281.8218 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							274.2433 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5139 (36)
Total fabric heat loss						(33) + (36) =	47.5365 (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	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470	71.0470 (39)
Average = Sum(39)m / 12 =												71.0470 (39)
HLP	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967	1.1967 (40)
HLP (average)												1.1967 (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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	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 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	Total = Sum(45)m = 1271.9194 (45)											
	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)
Output from w/h	Solar input (sum of months) = Sum(63)m = 0.0000 (63)											
	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	38.6262	34.3075	27.9007	21.1226	15.7894	13.3301	14.4036	18.7224	25.1291	31.9072	37.2404	39.6998 (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	444.7894	441.2269	424.2109	397.8725	371.1084	346.8955	332.5625	339.5201	354.5037	381.0266	410.5526	432.7046 (73)

6. Solar gains

[Jan]												
			Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North			3.0000	13.4684		0.6300	0.7000		0.7700		12.3484 (74)	
East			2.8900	25.1733		0.6300	0.7000		0.7700		22.2336 (76)	
West			5.5500	25.1733		0.6300	0.7000		0.7700		42.6977 (80)	
Solar gains	77.2796	128.3802	216.2183	320.7197	375.0085	427.7568	390.0676	345.4384	264.4044	164.4873	95.9341	60.2529 (83)
Total gains	522.0690	569.6071	640.4293	718.5922	746.1169	774.6523	722.6300	684.9585	618.9081	545.5139	506.4867	492.9574 (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	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583	63.6583
alpha	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439	5.2439
util living area	0.9891	0.9822	0.9553	0.8695	0.7019	0.4631	0.3238	0.3312	0.6187	0.8949	0.9759	0.9913 (86)
MIT	20.1578	20.2621	20.5040	20.7820	20.9452	20.9947	20.9994	20.9993	20.9782	20.7899	20.4363	20.1278 (87)
Th 2	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227 (88)
util rest of house	0.9851	0.9758	0.9393	0.8273	0.6242	0.3677	0.2185	0.2201	0.5110	0.8476	0.9653	0.9880 (89)
MIT 2	19.1890	19.2909	19.5233	19.7720	19.8950	19.9212	19.9226	19.9226	19.9153	19.7865	19.4627	19.1596 (90)
Living area fraction	19.5196	19.6223	19.8580	20.1166	20.2534	20.2876	20.2900	20.2900	20.2780	20.1289	19.7950	19.4900 (92)
MIT	19.5196	19.6223	19.8580	20.1166	20.2534	20.2876	20.2900	20.2900	20.2780	20.1289	19.7950	19.4900 (93)
Temperature adjustment												0.0000
adjusted MIT	19.5196	19.6223	19.8580	20.1166	20.2534	20.2876	20.2900	20.2900	20.2780	20.1289	19.7950	19.4900 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9831	0.9735	0.9381	0.8357	0.6493	0.4004	0.2545	0.2581	0.5479	0.8580	0.9638	0.9863 (94)
Ext temp.	513.2587	554.5132	600.8023	600.5560	484.4229	310.1440	183.9096	176.8005	339.0786	468.0452	488.1355	486.1844 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	988.9442	967.8251	870.8930	711.6511	508.2254	311.7236	184.0148	176.9089	346.5680	570.4290	795.3682	979.7379 (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	353.9101	277.7456	200.9475	79.9885	17.7091	0.0000	0.0000	0.0000	0.0000	76.1736	221.2076	367.2038 (98)
Space heating per m2	(98) / (4) = 26.8635 (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													1768.1660 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	353.9101	277.7456	200.9475	79.9885	17.7091	0.0000	0.0000	0.0000	0.0000	76.1736	221.2076	367.2038	(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)	392.3615	307.9220	222.7799	88.6791	19.6331	0.0000	0.0000	0.0000	0.0000	84.4496	245.2412	407.0996	(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	85.8847	85.5558	84.3980	81.6912	78.0151	76.2000	76.2000	76.2000	76.2000	81.4043	84.7600	86.0877	(216)
(217)m													(217)
Fuel for water heating, kWh/month	155.1142	136.1352	142.3541	128.1727	128.7325	113.6905	105.3510	120.9364	122.4258	133.6033	140.1162	149.8656	(219)
Water heating fuel used												1576.4976	(219)
Annual totals kWh/year													
Space heating fuel - main system												1768.1660	(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)												272.8604	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 696 * 1.00) =										-445.6456		-445.6456	(233)
Total delivered energy for all uses												3288.2512	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1768.1660	7.6100	134.5574 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1576.4976	7.6100	119.9715 (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	272.8604	31.0800	84.8050 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-445.6456	31.0800	-138.5067 (252)
Total energy cost			341.9959 (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	1768.1660	0.2160	381.9239 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1576.4976	0.2160	340.5235 (264)
Space and water heating			722.4473 (265)
Pumps and fans	116.3728	0.5190	60.3975 (267)
Energy for lighting	272.8604	0.5190	141.6146 (268)
Energy saving/generation technologies			
PV Unit	-445.6456	0.5190	-231.2901 (269)
Total kg/year			693.1693 (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	1768.1660	1.2200	2157.1625 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1576.4976	1.2200	1923.3270 (264)
Space and water heating			4080.4896 (265)
Pumps and fans	116.3728	3.0700	357.2645 (267)
Energy for lighting	272.8604	3.0700	837.6815 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit	-445.6456	3.0700	-1368.1321 (269)
Primary energy kWh/year			3907.3035 (272)
Primary energy kWh/m2/year			65.8128 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 86
Current environmental impact rating:	B 89

(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:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating:	B 86
Potential environmental impact rating:	B 89

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	£360	£360	£0
Space heating	£276	£276	£0
Water heating	£120	£120	£0
Lighting	£85	£85	£0
Generated (PV)	-£139	-£139	£0
Total cost of fuels	£342	£342	£0
Total cost of uses	£342	£342	£0
Delivered energy	55 kWh/m²	55 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	66 kWh/m²	66 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 22	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	18, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.29	TER	20.26
Environmental	89 B	% DER<TER	19.58		
CO ₂ Emissions (t/year)	0.69	DFEE	49.40	TFEE	55.07
General Requirements Compliance	Pass	% DFEE<TFEE	10.30		

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 22	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	18, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.29	TER	20.26
Environmental	89 B	% DER<TER	19.58		
CO ₂ Emissions (t/year)	0.69	DFEE	49.40	TFEE	55.07
General Requirements Compliance	Pass	% DFEE<TFEE	10.30		

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

Wall 000001

Wall Type: Standard Wall

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

Total resistance:	Upper limit = 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: 58.06 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0943 Plot 22	Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J
Project	18, Shaw Crescent, West End, Southampton, SO30 3LH		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	16.29	TER	20.26
Environmental	89 B	% DER<TER	19.58		
CO ₂ Emissions (t/year)	0.69	DFEE	49.40	TFEE	55.07
General Requirements Compliance	Pass	% DFEE<TFEE	10.30		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0943 Plot 22			Issued on Date	28/05/2024
Assessment Reference	As Built	Prop Type Ref	Block J		
Property	18, Shaw Crescent, West End, Southampton, SO30 3LH				
SAP Rating	86 B	DER	16.29	TER	20.26
Environmental	89 B	% DER<TER	19.58		
CO ₂ Emissions (t/year)	0.69	DFEE	49.40	TFEE	55.07
General Requirements Compliance	Pass	% DFEE<TFEE	10.30		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	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 24.48 m	Internal Floor Area 59.37 m ²
			Average Storey Height 2.40 m

7.0 Living Area	20.26	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	274.24	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	58.06	58.75	45.16

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	13.24

9.2 Internal Walls					
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)	
Ground Floor Block	Dense block, plasterboard on dabs		75.00	30.53	
Ground Floor Stud	Plasterboard on timber frame		9.00	81.31	

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	1.44	1.44

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	57.76

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Other	0.00	57.93

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	North							2.15	
Front Elevation	Window	[1] Brick and Block	North	None	0.00					3.00	
Side Elevation	Window	[1] Brick and Block	East	None	0.00					2.89	
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)	1.94	0.060	No	
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	1.64	0.240	No	
Independently assessed	E12 Gable (insulation at ceiling level)	1.64	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	2.40	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	11.33	0.160	No	
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.33	0.000	No	

Y-value 0.113 W/m²K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	2.53	m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	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

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Controls	CBE Programmer, room thermostat and TRVs			
PCDF Controls	0			
Delayed Start Stat	No			
Sap Code	2106			
Flue Type	Balanced			
Fan Assisted Flue	Yes			
Is MHS Pumped	Pump in heated space			
Heat Emitter	Radiators			
Flow Temperature	Normal (> 45°C)			
Combi boiler type	Standard Combi			
Combi keep hot type	None			

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None