



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 9 Haines Crescent
WEST END, SO30 3LG

Contact: Tobias Whiting
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Report Issue Date: 02/08/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 94				Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)			
Property	9 Haines Crescent, WEST END, SO30 3LG					
SAP Rating	81 B	DER	16.09	TER	20.95	
Environmental	89 B	% DER<TER	23.19			
CO ₂ Emissions (t/year)	0.72	DFEE	55.10	TFEE	57.90	
General Requirements Compliance	Pass	% DFEE<TFEE	4.84			
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)	20.95	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.09	kgCO ₂ /m ²	Pass
	-4.86 (-23.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.90	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	55.10	kWh/m ² /yr	
	-2.8 (-4.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.27 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.28 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 30Si Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.35

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 South East

3.66 m², No overhang

Windows facing North West

4.97 m², No overhang

Air change rate

3.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Floor U-value

0.12

W/m²K

Door U-value

1.10

W/m²K

Photovoltaic array

700.03

kWh/Year

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Property	9 Haines Crescent, WEST END, SO30 3LG		
SAP Rating	81 B	DER	16.09
Environmental	89 B	TER	20.95
CO ₂ Emissions (t/year)	0.72	% DER<TER	23.19
General Requirements Compliance	Pass	DFEE	55.10
		TFEE	57.90
		% DFEE<TFEE	4.84
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	7.64	2.29	
External wall	E3 Sill	Table K1 - Approved	0.040	6.63	0.27	
External wall	E4 Jamb	Table K1 - Approved	0.050	19.80	0.99	
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	28.48	4.56	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	28.48	1.99	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	8.04	0.72	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	2.68	0.16	
External wall	E25 Staggered party wall between dwellings	Table K1 - Default	0.120	2.68	0.32	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	3.45	0.55	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	3.45	0.00	

Total: **11.86** W/mK:
Y-Value: **0.086** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	89 B	% DER<TER	23.19		
CO ₂ Emissions (t/year)	0.72	DFEE	55.10	TFEE	57.90
General Requirements Compliance	Pass	% DFEE<TFEE	4.84		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Ground-floor flat, total floor area 61 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) 20.95 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.09 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)55.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.27 (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	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.28 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 30Si Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system
Specific fan power: 0.35
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading:
Average
Windows facing South East: 3.66 m², No overhang
Windows facing North West: 4.97 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 700.03 kWh/Year

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	60.8000 (1b)	x 2.6800 (2b)	= 162.9440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 162.9440 (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					4.2800
Infiltration rate					0.2140 (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) =				0.1980 (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	0.2524	0.2474	0.2425	0.2177	0.2128	0.1881	0.1881	0.1831	0.1980	0.2128	0.2227	0.2326 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5024	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.6300	1.1450	9.8817		(27)
Heat Loss Floor 1			60.8000	0.1200	7.2960		(28a)
Ground Floor Walls	69.1500	8.6300	60.5200	0.2700	16.3404		(29a)
Wall to Corridor	7.1800	2.1200	5.0600	0.2041	1.0327		(29a)
Total net area of external elements Aum(A, m ²)				137.1300			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.8827		(33)
Party Wall 1				9.2500	0.0000	0.0000	(32)
Party Ceilings 1				60.5800			(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.8556 (36)
Total fabric heat loss							(33) + (36) = 48.7383 (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	27.0141	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858 (38)
Heat transfer coeff	75.7524	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241 (39)
Average = Sum(39)m / 12 =												75.6348 (39)
HLP	1.2459	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438 (40)
HLP (average)												1.2440 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0042 (42)
Average daily hot water use (litres/day)												81.7988 (43)
Daily hot water use	89.9787	86.7068	83.4348	80.1628	76.8909	73.6189	73.6189	76.8909	80.1628	83.4348	86.7068	89.9787 (44)
Energy conte	133.4358	116.7038	120.4279	104.9920	100.7423	86.9329	80.5561	92.4393	93.5434	109.0158	118.9992	129.2255 (45)
Energy content (annual)												Total = Sum(45)m = 1287.0140 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0154	17.5056	18.0642	15.7488	15.1113	13.0399	12.0834	13.8659	14.0315	16.3524	17.8499	19.3838 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	31.1782	28.1472	31.1410	30.1116	31.0973	30.0733	31.0628	31.0851	30.0942	31.1229	30.1477	31.1710	(61)
Total heat required for water heating calculated for each month	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965	(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	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965	(64)
Heat gains from water heating, kWh/month	52.1620	45.8408	47.8275	42.4377	41.2711	36.4235	34.5506	38.5074	38.6267	44.0285	47.1042	50.7602	(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	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6837	14.8183	12.0510	9.1234	6.8199	5.7576	6.2213	8.0867	10.8539	13.7816	16.0851	17.1474	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.9600	176.7755	172.2004	162.4606	150.1658	138.6104	130.8907	129.0752	133.6503	143.3901	155.6849	167.2403	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	(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)	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	(71)
Water heating gains (Table 5)	70.1102	68.2155	64.2843	58.9413	55.4719	50.5882	46.4390	51.7572	53.6482	59.1781	65.4225	68.2261	(72)
Total internal gains	317.8162	315.8717	304.5982	286.5877	268.5200	251.0187	239.6134	244.9815	254.2148	272.4121	293.2549	308.6761	(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
Southeast				3.6600	36.7938	0.6300	0.7000			0.7700			41.1555 (77)
Northwest				4.9700	11.2829	0.6300	0.7000			0.7700			17.1376 (81)

Solar gains	58.2931	104.9872	158.7681	222.0650	271.8638	280.0730	265.7858	227.0781	180.4428	120.1100	70.8584	49.2160	(83)
Total gains	376.1093	420.8589	463.3663	508.6527	540.3838	531.0917	505.3992	472.0596	434.6576	392.5221	364.1133	357.8921	(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	55.7371	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317		
alpha	4.7158	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221		
util living area	0.9977	0.9957	0.9900	0.9713	0.9143	0.7849	0.6240	0.6814	0.8913	0.9808	0.9956	0.9982	(86)	
MIT	19.6491	19.7873	20.0314	20.3606	20.6822	20.8980	20.9736	20.9602	20.7959	20.3902	19.9541	19.6130	(87)	
Th 2	19.8834	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	(88)	
util rest of house	0.9969	0.9941	0.9863	0.9593	0.8762	0.6920	0.4827	0.5420	0.8279	0.9707	0.9938	0.9976	(89)	
MIT 2	18.6605	18.7995	19.0419	19.3645	19.6641	19.8363	19.8783	19.8734	19.7672	19.3973	18.9663	18.6259	(90)	
Living area fraction	18.9894	19.1281	19.3711	19.6959	20.0029	20.1895	20.2427	20.2350	20.1095	19.7277	19.2950	18.9543	(92)	
Temperature adjustment	18.9894	19.1281	19.3711	19.6959	20.0029	20.1895	20.2427	20.2350	20.1095	19.7277	19.2950	18.9543	(93)	
adjusted MIT	18.9894	19.1281	19.3711	19.6959	20.0029	20.1895	20.2427	20.2350	20.1095	19.7277	19.2950	18.9543	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9960	0.9927	0.9840	0.9568	0.8810	0.7201	0.5305	0.5891	0.8431	0.9688	0.9924	0.9968	(94)	
Ext temp.	374.6114	417.7997	455.9653	486.6575	476.0594	382.4397	268.1121	278.0756	366.4608	380.2601	361.3629	356.7584	(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	1112.7610	1075.9896	973.3665	816.4328	627.8981	422.7038	275.4779	290.0193	454.4619	690.2742	922.2322	1115.7823	(97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)	
Space heating per m2	549.1833	442.3036	384.9465	237.4383	112.9680	0.0000	0.0000	0.0000	0.0000	230.6505	403.8259	564.7138	(98)	
												2926.0300	(98)	
												48.1255	(99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3226.0529 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	549.1833	442.3036	384.9465	237.4383	112.9680	0.0000	0.0000	0.0000	0.0000	230.6505	403.8259	564.7138	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	605.4943	487.6556	424.4173	261.7842	124.5513	0.0000	0.0000	0.0000	0.0000	254.3005	445.2325	622.6172	(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	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965	(64)
Efficiency of water heater (217)m	89.8191	89.7583	89.6232	89.3224	88.6692	87.0000	87.0000	87.0000	87.0000	89.2652	89.6714	89.8547	(216)
Fuel for water heating, kWh/month	183.2729	161.3790	169.1179	151.2539	148.6870	134.4899	128.2976	141.9822	142.1121	156.9914	166.3261	178.5065	(219)
Water heating fuel used												1862.4167	(219)
Annual totals kWh/year													
Space heating fuel - main system													3226.0529 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4900)													
mechanical ventilation fans (SFP = 0.4900)													97.4079 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													172.4079 (231)
Electricity for lighting (calculated in Appendix L)													294.6388 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													5555.5163 (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	3226.0529	0.2160	696.8274 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1862.4167	0.2160	402.2820 (264)
Space and water heating			1099.1094 (265)
Pumps and fans	172.4079	0.5190	89.4797 (267)
Energy for lighting	294.6388	0.5190	152.9175 (268)
Energy saving/generation technologies			
PV Unit	-700.0300	0.5190	-363.3156 (269)
Total CO2, kg/year			978.1911 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.0900 (273)

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

DER			16.0900 ZC1
Total Floor Area		TFA	60.8000
Assumed number of occupants		N	2.0042
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.0522 ZC2
CO2 emissions from cooking, equation (L16)			2.7484 ZC3
Total CO2 emissions			35.8906 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			35.8906 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	60.8000 (1b)	x 2.6800 (2b)	= 162.9440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 162.9440 (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) = 0.1227 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3727 (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) =				0.3448 (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	0.4396	0.4310	0.4224	0.3793	0.3706	0.3275	0.3275	0.3189	0.3448	0.3706	0.3879	0.4051 (22b)
	0.5966	0.5929	0.5892	0.5719	0.5687	0.5536	0.5536	0.5509	0.5594	0.5687	0.5752	0.5821 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			8.6300	1.3258	11.4413		(27)
Heat Loss Floor 1			60.8000	0.1300	7.9040		(28a)
Ground Floor Walls	69.1500	8.6300	60.5200	0.1800	10.8936		(29a)
Wall to Corridor	7.1800	2.1200	5.0600	0.1800	0.9108		(29a)
Total net area of external elements Aum(A, m ²)			137.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.2697		(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)							9.5751 (36)
Total fabric heat loss						(33) + (36) =	42.8448 (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	32.0814	31.8797	31.6819	30.7531	30.5793	29.7702	29.7702	29.6204	30.0819	30.5793	30.9308	31.2984 (38)
Heat transfer coeff	74.9262	74.7245	74.5267	73.5978	73.4240	72.6150	72.6150	72.4652	72.9267	73.4240	73.7756	74.1432 (39)
Average = Sum(39)m / 12 =												73.5970 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2323	1.2290	1.2258	1.2105	1.2076	1.1943	1.1943	1.1919	1.1995	1.2076	1.2134	1.2195 (40)
HLP (average)												1.2105 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0042 (42)
Average daily hot water use (litres/day)												81.7988 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	89.9787	86.7068	83.4348	80.1628	76.8909	73.6189	73.6189	76.8909	80.1628	83.4348	86.7068	89.9787 (44)
Energy conte	133.4358	116.7038	120.4279	104.9920	100.7423	86.9329	80.5561	92.4393	93.5434	109.0158	118.9992	129.2255 (45)
Energy content (annual)										Total = Sum(45)m =		1287.0140 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0154	17.5056	18.0642	15.7488	15.1113	13.0399	12.0834	13.8659	14.0315	16.3524	17.8499	19.3838 (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)

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Combi loss	45.8522	39.9089	42.5175	39.5324	39.1828	36.3052	37.5154	39.1828	39.5324	42.5175	42.7595	45.8522 (61)
Total heat required for water heating calculated for each month	179.2880	156.6127	162.9454	144.5243	139.9250	123.2382	118.0715	131.6221	133.0757	151.5332	161.7587	175.0776 (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	179.2880	156.6127	162.9454	144.5243	139.9250	123.2382	118.0715	131.6221	133.0757	151.5332	161.7587	175.0776 (64)
Heat gains from water heating, kWh/month	55.8305	48.7812	50.6716	44.7929	43.2925	37.9815	36.1638	40.5318	40.9863	46.8771	50.2571	54.4305 (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	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6837	14.8183	12.0510	9.1234	6.8199	5.7576	6.2213	8.0867	10.8539	13.7816	16.0851	17.1474	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.9600	176.7755	172.2004	162.4606	150.1658	138.6104	130.8907	129.0752	133.6503	143.3901	155.6849	167.2403	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	(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)	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	(71)
Water heating gains (Table 5)	75.0409	72.5911	68.1070	62.2124	58.1888	52.7521	48.6072	54.4782	56.9254	63.0069	69.8016	73.1593	(72)
Total internal gains	322.7470	320.2473	308.4209	289.8588	271.2369	253.1825	241.7816	247.7025	257.4920	276.2409	297.6340	313.6093	(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
Southeast					3.6600	36.7938		0.6300		0.7000	0.7700	41.1555 (77)
Northwest					4.9700	11.2829		0.6300		0.7000	0.7700	17.1376 (81)
Solar gains	58.2931	104.9872	158.7681	222.0650	271.8638	280.0730	265.7858	227.0781	180.4428	120.1100	70.8584	49.2160 (83)
Total gains	381.0401	425.2345	467.1890	511.9238	543.1007	533.2555	507.5675	474.7806	437.9348	396.3509	368.4923	362.8253 (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	56.3517	56.5039	56.6538	57.3688	57.5046	58.1453	58.1453	58.2655	57.8968	57.5046	57.2306	56.9469	
alpha	4.7568	4.7669	4.7769	4.8246	4.8336	4.8764	4.8764	4.8844	4.8598	4.8336	4.8154	4.7965	
util living area	0.9976	0.9954	0.9896	0.9694	0.9082	0.7682	0.6034	0.6596	0.8814	0.9793	0.9954	0.9981	(86)
MIT	19.6742	19.8126	20.0579	20.3976	20.7102	20.9156	20.9797	20.9691	20.8206	20.4261	19.9941	19.6524	(87)
Th 2	19.8942	19.8969	19.8994	19.9116	19.9139	19.9245	19.9245	19.9265	19.9204	19.9139	19.9093	19.9045	(88)
util rest of house	0.9967	0.9939	0.9857	0.9569	0.8689	0.6761	0.4689	0.5259	0.8161	0.9686	0.9934	0.9974	(89)
MIT 2	18.1364	18.3401	18.6986	19.1942	19.6202	19.8659	19.9169	19.9133	19.7701	19.2423	18.6144	18.1116	(90)
Living area fraction									fLA = Living area / (4) =			0.3327	(91)
MIT	18.6481	18.8300	19.1509	19.5946	19.9829	20.2152	20.2705	20.2646	20.1196	19.6362	19.0735	18.6243	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6481	18.8300	19.1509	19.5946	19.9829	20.2152	20.2705	20.2646	20.1196	19.6362	19.0735	18.6243	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9953	0.9917	0.9821	0.9522	0.8719	0.7033	0.5141	0.5706	0.8303	0.9649	0.9913	0.9963	(94)
Ext temp.	379.2647	421.6884	458.8090	487.4664	473.5087	375.0636	260.9330	270.9231	363.6363	382.4346	365.2842	361.4801	(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	1075.0479	1040.9146	942.8282	787.1017	608.1609	407.7470	266.5330	280.0492	438.9917	663.4737	883.3531	1069.4609	(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	517.6627	416.1200	360.1103	215.7374	100.1812	0.0000	0.0000	0.0000	0.0000	209.0931	373.0096	526.7377	(98)
Space heating per m2												2718.6520	(98)
										(98) / (4) =		44.7147	(99)

8c. Space cooling requirement

Not applicable

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

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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	2910.7623	(211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	517.6627	416.1200	360.1103	215.7374	100.1812	0.0000	0.0000	0.0000	0.0000	209.0931	373.0096	526.7377	(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)	554.2427	445.5246	385.5571	230.9823	107.2604	0.0000	0.0000	0.0000	0.0000	223.8684	399.3679	563.9589	(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	179.2880	156.6127	162.9454	144.5243	139.9250	123.2382	118.0715	131.6221	133.0757	151.5332	161.7587	175.0776	(64)
Efficiency of water heater	87.5667	87.3942	86.9914	86.0577	84.2263	80.3000	80.3000	80.3000	80.3000	85.8621	87.0867	87.6498	(216)
(217)m	87.5667	87.3942	86.9914	86.0577	84.2263	80.3000	80.3000	80.3000	80.3000	85.8621	87.0867	87.6498	(217)
Fuel for water heating, kWh/month	204.7445	179.2027	187.3120	167.9388	166.1299	153.4722	147.0380	163.9130	165.7232	176.4845	185.7445	199.7468	(219)
Water heating fuel used	204.7445	179.2027	187.3120	167.9388	166.1299	153.4722	147.0380	163.9130	165.7232	176.4845	185.7445	199.7468	(219)
Annual totals kWh/year												2097.4500	(219)
Space heating fuel - main system												2910.7623	(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)												294.6388	(232)
Total delivered energy for all uses												5377.8511	(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	2910.7623	0.2160	628.7247 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2097.4500	0.2160	453.0492 (264)
Space and water heating			1081.7739 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	294.6388	0.5190	152.9175 (268)
Total CO2, kg/m2/year			1273.6164 (272)
Emissions per m2 for space and water heating			17.7923 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5151 (272b)
Emissions per m2 for pumps and fans			0.6402 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7923 * 1.00) + 2.5151 + 0.6402, rounded to 2 d.p.			20.9500 (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	60.8000 (1b)	x 2.6800 (2b)	= 162.9440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 162.9440 (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) = 0.1227 (8)
Measured/design AP50					Yes
Infiltration rate					4.2800
Number of sides sheltered					0.3367 (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) =				0.3115 (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	0.3971	0.3894	0.3816	0.3426	0.3348	0.2959	0.2959	0.2881	0.3115	0.3348	0.3504	0.3660 (22b)
	0.5789	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.6300	1.1450	9.8817		(27)
Heat Loss Floor 1			60.8000	0.1200	7.2960		(28a)
Ground Floor Walls	69.1500	8.6300	60.5200	0.2700	16.3404		(29a)
Wall to Corridor	7.1800	2.1200	5.0600	0.2041	1.0327		(29a)
Total net area of external elements Aum(A, m ²)			137.1300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.8827		(33)
Party Wall 1			9.2500	0.0000	0.0000		(32)
Party Ceilings 1			60.5800				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.8556 (36)
Total fabric heat loss						(33) + (36) =	48.7383 (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	31.1263	30.9616	30.8002	30.0421	29.9003	29.2400	29.2400	29.1177	29.4943	29.9003	30.1872	30.4872 (38)
Heat transfer coeff	79.8646	79.7000	79.5385	78.7804	78.6386	77.9783	77.9783	77.8560	78.2326	78.6386	78.9255	79.2255 (39)
Average = Sum(39)m / 12 =												78.7798 (39)
HLP	1.3136	1.3109	1.3082	1.2957	1.2934	1.2825	1.2825	1.2805	1.2867	1.2934	1.2981	1.3031 (40)
HLP (average)												1.2957 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0042 (42)
Average daily hot water use (litres/day)												81.7988 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	89.9787	86.7068	83.4348	80.1628	76.8909	73.6189	73.6189	76.8909	80.1628	83.4348	86.7068	89.9787 (44)
Energy content (annual)	133.4358	116.7038	120.4279	104.9920	100.7423	86.9329	80.5561	92.4393	93.5434	109.0158	118.9992	129.2255 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1287.0140 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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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	28.3551	24.7996	25.5909	22.3108	21.4077	18.4732	17.1182	19.6434	19.8780	23.1659	25.2873	27.4604 (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	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6837	14.8183	12.0510	9.1234	6.8199	5.7576	6.2213	8.0867	10.8539	13.7816	16.0851	17.1474 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.9600	176.7755	172.2004	162.4606	150.1658	138.6104	130.8907	129.0752	133.6503	143.3901	155.6849	167.2403 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208 (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)	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664 (71)
Water heating gains (Table 5)	38.1117	36.9041	34.3964	30.9872	28.7738	25.6573	23.0083	26.4024	27.6083	31.1369	35.1213	36.9092 (72)
Total internal gains	282.8177	281.5603	271.7103	255.6336	238.8219	223.0877	213.1827	216.6266	225.1749	241.3710	259.9537	274.3592 (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

Southeast				3.6600	36.7938		0.6300		0.7000		0.7700	41.1555 (77)
Northwest				4.9700	11.2829		0.6300		0.7000		0.7700	17.1376 (81)

Solar gains	58.2931	104.9872	158.7681	222.0650	271.8638	280.0730	265.7858	227.0781	180.4428	120.1100	70.8584	49.2160 (83)
Total gains	341.1109	386.5475	430.4784	477.6986	510.6857	503.1607	478.9686	443.7047	405.6177	361.4809	330.8121	323.5752 (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	52.8672	52.9765	53.0840	53.5948	53.6915	54.1461	54.1461	54.2312	53.9701	53.6915	53.4963	53.2937
alpha	4.5245	4.5318	4.5389	4.5730	4.5794	4.6097	4.6097	4.6154	4.5980	4.5794	4.5664	4.5529
util living area	0.9984	0.9970	0.9928	0.9784	0.9327	0.8184	0.6647	0.7244	0.9163	0.9866	0.9971	0.9988 (86)
MIT	19.5103	19.6527	19.9101	20.2689	20.6161	20.8683	20.9627	20.9446	20.7466	20.3057	19.8460	19.4855 (87)
Th 2	19.8302	19.8323	19.8344	19.8442	19.8460	19.8545	19.8545	19.8561	19.8512	19.8460	19.8423	19.8384 (88)
util rest of house	0.9979	0.9959	0.9900	0.9689	0.8999	0.7286	0.5161	0.5812	0.8611	0.9791	0.9958	0.9984 (89)
MIT 2	18.4804	18.6240	18.8819	19.2433	19.5735	19.7895	19.8446	19.8392	19.6996	19.2843	18.8251	18.4620 (90)
Living area fraction									fLA = Living area / (4) =			0.3327 (91)
MIT	18.8230	18.9663	19.2240	19.5845	19.9204	20.1484	20.2167	20.2070	20.0479	19.6241	19.1648	18.8026 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8230	18.9663	19.2240	19.5845	19.9204	20.1484	20.2167	20.2070	20.0479	19.6241	19.1648	18.8026 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9947	0.9880	0.9661	0.9025	0.7547	0.5666	0.6296	0.8728	0.9771	0.9948	0.9978 (94)
Useful gains	340.1618	384.5098	425.3249	461.5192	460.8780	379.7399	271.3837	279.3424	354.0147	353.2119	329.0794	322.8694 (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	1159.8769	1121.0829	1012.0489	841.7307	646.4407	432.6574	282.0204	296.3986	465.3238	709.6445	952.2222	1156.8955 (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	609.8681	494.9771	436.5227	273.7523	138.0586	0.0000	0.0000	0.0000	0.0000	265.1859	448.6628	620.5154 (98)
Space heating												3287.5429 (98)
Space heating per m2										(98) / (4) =		54.0714 (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	732.9961	577.0395	591.7059	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7785	0.8579	0.8234	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	570.6120	495.0623	487.1900	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	663.4029	633.6919	593.7969	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	66.8095	103.1405	79.3155	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												249.2654 (104)

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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	16.7024	25.7851	19.8289	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												62.3164 (107)
Space cooling per m2												1.0249 (108)
Energy for space heating												54.0714 (99)
Energy for space cooling												1.0249 (108)
Total												55.0964 (109)
Dwelling Fabric Energy Efficiency (DFEE)												55.1 (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	60.8000 (1b)	x 2.6800 (2b)	= 162.9440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 162.9440 (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) = 0.1227 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3727 (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) =	0.3448 (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	0.4396	0.4310	0.4224	0.3793	0.3706	0.3275	0.3275	0.3189	0.3448	0.3706	0.3879	0.4051 (22b)
Effective ac	0.5966	0.5929	0.5892	0.5719	0.5687	0.5536	0.5536	0.5509	0.5594	0.5687	0.5752	0.5821 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			8.6300	1.3258	11.4413		(27)
Heat Loss Floor 1			60.8000	0.1300	7.9040		(28a)
Ground Floor Walls	69.1500	8.6300	60.5200	0.1800	10.8936		(29a)
Wall to Corridor	7.1800	2.1200	5.0600	0.1800	0.9108		(29a)
Total net area of external elements Aum(A, m ²)			137.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.2697		(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)							9.5751 (36)
Total fabric heat loss						(33) + (36) =	42.8448 (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	32.0814	31.8797	31.6819	30.7531	30.5793	29.7702	29.7702	29.6204	30.0819	30.5793	30.9308	31.2984 (38)
Heat transfer coeff	74.9262	74.7245	74.5267	73.5978	73.4240	72.6150	72.6150	72.4652	72.9267	73.4240	73.7756	74.1432 (39)
Average = Sum(39)m / 12 =												73.5970 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2323	1.2290	1.2258	1.2105	1.2076	1.1943	1.1943	1.1919	1.1995	1.2076	1.2134	1.2195 (40)
HLP (average)												1.2105 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0042 (42)
Average daily hot water use (litres/day)												81.7988 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	89.9787	86.7068	83.4348	80.1628	76.8909	73.6189	73.6189	76.8909	80.1628	83.4348	86.7068	89.9787 (44)
Energy conte	133.4358	116.7038	120.4279	104.9920	100.7423	86.9329	80.5561	92.4393	93.5434	109.0158	118.9992	129.2255 (45)
Energy content (annual)												Total = Sum(45)m = 1287.0140 (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)

FULL SAP CALCULATION PRINTOUT

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	28.3551	24.7996	25.5909	22.3108	21.4077	18.4732	17.1182	19.6434	19.8780	23.1659	25.2873	27.4604 (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	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	100.2081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6837	14.8183	12.0510	9.1234	6.8199	5.7576	6.2213	8.0867	10.8539	13.7816	16.0851	17.1474	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.9600	176.7755	172.2004	162.4606	150.1658	138.6104	130.8907	129.0752	133.6503	143.3901	155.6849	167.2403	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	33.0208	(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)	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	(71)
Water heating gains (Table 5)	38.1117	36.9041	34.3964	30.9872	28.7738	25.6573	23.0083	26.4024	27.6083	31.1369	35.1213	36.9092	(72)
Total internal gains	282.8177	281.5603	271.7103	255.6336	238.8219	223.0877	213.1827	216.6266	225.1749	241.3710	259.9537	274.3592	(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
Southeast												3.6600	36.7938	0.6300	0.7000	0.7700	41.1555 (77)
Northwest												4.9700	11.2829	0.6300	0.7000	0.7700	17.1376 (81)
Solar gains	58.2931	104.9872	158.7681	222.0650	271.8638	280.0730	265.7858	227.0781	180.4428	120.1100	70.8584	49.2160 (83)					
Total gains	341.1109	386.5475	430.4784	477.6986	510.6857	503.1607	478.9686	443.7047	405.6177	361.4809	330.8121	323.5752 (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	56.3517	56.5039	56.6538	57.3688	57.5046	58.1453	58.1453	58.2655	57.8968	57.5046	57.2306	56.9469	
alpha	4.7568	4.7669	4.7769	4.8246	4.8336	4.8764	4.8764	4.8844	4.8598	4.8336	4.8154	4.7965	
util living area	0.9985	0.9970	0.9926	0.9764	0.9242	0.7953	0.6331	0.6945	0.9052	0.9856	0.9971	0.9988	(86)
MIT	19.6141	19.7549	20.0045	20.3520	20.6776	20.9010	20.9751	20.9614	20.7917	20.3774	19.9377	19.5930	(87)
Th 2	19.8942	19.8969	19.8994	19.9116	19.9139	19.9245	19.9245	19.9265	19.9204	19.9139	19.9093	19.9045	(88)
util rest of house	0.9980	0.9959	0.9897	0.9664	0.8896	0.7059	0.4950	0.5588	0.8476	0.9778	0.9958	0.9984	(89)
MIT 2	18.6341	18.7766	19.0270	19.3787	19.6864	19.8763	19.9179	19.9148	19.7970	19.4088	18.9693	18.6212	(90)
Living area fraction	18.9602	19.1021	19.3523	19.7026	20.0162	20.2173	20.2697	20.2631	20.1280	19.7311	19.2915	18.9445	(91)
MIT	18.9602	19.1021	19.3523	19.7026	20.0162	20.2173	20.2697	20.2631	20.1280	19.7311	19.2915	18.9445	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9602	19.1021	19.3523	19.7026	20.0162	20.2173	20.2697	20.2631	20.1280	19.7311	19.2915	18.9445	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9974	0.9948	0.9878	0.9640	0.8934	0.7329	0.5417	0.6046	0.8609	0.9761	0.9949	0.9979	(94)
Useful gains	340.2071	384.5479	425.2322	460.4858	456.2696	368.7417	259.4747	268.2678	349.1969	352.8339	329.1139	322.9116	(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	1098.4331	1061.2444	957.8379	795.0466	610.6115	407.8978	266.4729	279.9372	439.5984	670.4424	899.4366	1093.2052	(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	564.1201	454.7401	396.2586	240.8838	114.8304	0.0000	0.0000	0.0000	0.0000	236.3007	410.6324	573.0985	(98)
Space heating												2990.8645	(98)
Space heating per m2											(98) / (4) =	49.1919	(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	682.5813	537.3513	550.7357	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8178	0.8904	0.8597	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	558.2069	478.4455	473.4757	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	663.4029	633.6919	593.7969	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	75.7412	115.5034	89.5189	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												280.7635	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)													

fC = cooled area / (4) =

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	18.9353	28.8758	22.3797	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												70.1909 (107)
Energy for space heating												1.1545 (108)
Energy for space cooling												49.1919 (99)
Total												1.1545 (108)
Target Fabric Energy Efficiency (TFEE)												50.3463 (109)
												57.9 (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	60.8000 (1b)	x 2.6800 (2b)	= 162.9440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 162.9440 (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							4.2800					
Infiltration rate							0.2140	(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) =	0.1980	(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	0.2326	0.2177	0.2177	0.1980	0.2029	0.1930	0.1930	0.1881	0.1881	0.2029	0.1980	0.2029
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
												(22)
												(22a)
												(22b)
												(23a)
												(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.6300	1.1450	9.8817		(27)
Heat Loss Floor 1			60.8000	0.1200	7.2960		(28a)
Ground Floor Walls	69.1500	8.6300	60.5200	0.2700	16.3404		(29a)
Wall to Corridor	7.1800	2.1200	5.0600	0.2041	1.0327		(29a)
Total net area of external elements Aum(A, m ²)			137.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.8827		(33)
Party Wall 1			9.2500	0.0000	0.0000		(32)
Party Ceilings 1			60.5800				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.8556 (36)
Total fabric heat loss						(33) + (36) =	48.7383 (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	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858 (38)
Heat transfer coeff	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241 (39)
Average = Sum(39)m / 12 =												75.6241 (39)
HLP	Jan 1.2438	Feb 1.2438	Mar 1.2438	Apr 1.2438	May 1.2438	Jun 1.2438	Jul 1.2438	Aug 1.2438	Sep 1.2438	Oct 1.2438	Nov 1.2438	Dec 1.2438 (40)
HLP (average)												1.2438 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0042 (42)
Average daily hot water use (litres/day)												81.7988 (43)
Daily hot water use	Jan 89.9787	Feb 86.7068	Mar 83.4348	Apr 80.1628	May 76.8909	Jun 73.6189	Jul 73.6189	Aug 76.8909	Sep 80.1628	Oct 83.4348	Nov 86.7068	Dec 89.9787 (44)
Energy conte	133.4358	116.7038	120.4279	104.9920	100.7423	86.9329	80.5561	92.4393	93.5434	109.0158	118.9992	129.2255 (45)
Energy content (annual)										Total = Sum(45)m =		1287.0140 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0154	17.5056	18.0642	15.7488	15.1113	13.0399	12.0834	13.8659	14.0315	16.3524	17.8499	19.3838 (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	31.1782	28.1472	31.1410	30.1116	31.0973	30.0733	31.0628	31.0851	30.0942	31.1229	30.1477	31.1710 (61)
Total heat required for water heating calculated for each month												
	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965 (64)
Total per year (kWh/year) = Sum(64)m =												1653.4464 (64)
RHI water heating demand												1653 (64)
Heat gains from water heating, kWh/month												
	52.1620	45.8408	47.8275	42.4377	41.2711	36.4235	34.5506	38.5074	38.6267	44.0285	47.1042	50.7602 (65)

[illegible]

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	60.8000 (1b)	x 2.6800 (2b)	= 162.9440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 162.9440 (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					4.2800
Infiltration rate					0.2140 (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) =				0.1980 (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	0.2524	0.2474	0.2425	0.2177	0.2128	0.1881	0.1881	0.1831	0.1980	0.2128	0.2227	0.2326 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5024	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.6300	1.1450	9.8817		(27)
Heat Loss Floor 1			60.8000	0.1200	7.2960		(28a)
Ground Floor Walls	69.1500	8.6300	60.5200	0.2700	16.3404		(29a)
Wall to Corridor	7.1800	2.1200	5.0600	0.2041	1.0327		(29a)
Total net area of external elements Aum(A, m ²)				137.1300			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.8827		(33)
Party Wall 1				9.2500	0.0000	0.0000	(32)
Party Ceilings 1				60.5800			(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.8556 (36)
Total fabric heat loss							(33) + (36) = 48.7383 (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	27.0141	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858 (38)
Heat transfer coeff	75.7524	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241 (39)
Average = Sum(39)m / 12 =												75.6348 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2459	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0042 (42)
Average daily hot water use (litres/day)												81.7988 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	89.9787	86.7068	83.4348	80.1628	76.8909	73.6189	73.6189	76.8909	80.1628	83.4348	86.7068	89.9787 (44)
Energy content (annual)	133.4358	116.7038	120.4279	104.9920	100.7423	86.9329	80.5561	92.4393	93.5434	109.0158	118.9992	129.2255 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1287.0140 (45)
	20.0154	17.5056	18.0642	15.7488	15.1113	13.0399	12.0834	13.8659	14.0315	16.3524	17.8499	19.3838 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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	31.1782	28.1472	31.1410	30.1116	31.0973	30.0733	31.0628	31.0851	30.0942	31.1229	30.1477	31.1710	(61)
Total heat required for water heating calculated for each month	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965	(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	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965	(64)
Heat gains from water heating, kWh/month	52.1620	45.8408	47.8275	42.4377	41.2711	36.4235	34.5506	38.5074	38.6267	44.0285	47.1042	50.7602	(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	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.7092	37.0457	30.1276	22.8085	17.0496	14.3940	15.5533	20.2167	27.1348	34.4539	40.2128	42.8684	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.1343	263.8440	257.0155	242.4785	224.1280	206.8812	195.3593	192.6495	199.4780	214.0151	232.3655	249.6123	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	(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)	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	(71)
Water heating gains (Table 5)	70.1102	68.2155	64.2843	58.9413	55.4719	50.5882	46.4390	51.7572	53.6482	59.1781	65.4225	68.2261	(72)
Total internal gains	465.0659	461.2176	443.5398	416.3406	388.7620	363.9758	349.4639	356.7358	372.3734	399.7594	430.1131	452.8192	(73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains					
			m2	Table 6a	or Table 6b	or Table 6c	factor	W					
				W/m2			Table 6d						
Southeast			3.6600	36.7938	0.6300	0.7000	0.7700	41.1555					
Northwest			4.9700	11.2829	0.6300	0.7000	0.7700	17.1376 (77)					
Solar gains	58.2931	104.9872	158.7681	222.0650	271.8638	280.0730	265.7858	227.0781	180.4428	120.1100	70.8584	49.2160	(83)
Total gains	523.3591	566.2048	602.3079	638.4057	660.6258	644.0488	615.2497	583.8139	552.8162	519.8693	500.9715	502.0352	(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	55.7371	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317		
alpha	4.7158	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221		
util living area	0.9908	0.9854	0.9725	0.9367	0.8500	0.6913	0.5268	0.5738	0.8006	0.9471	0.9840	0.9924	(86)	
MIT	19.8667	19.9983	20.2242	20.5185	20.7847	20.9411	20.9869	20.9805	20.8797	20.5533	20.1522	19.8272	(87)	
Th 2	19.8834	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	(88)	
util rest of house	0.9879	0.9807	0.9632	0.9142	0.7973	0.5941	0.4004	0.4456	0.7173	0.9235	0.9779	0.9900	(89)	
MIT 2	18.8762	19.0074	19.2289	19.5098	19.7450	19.8592	19.8820	19.8799	19.8229	19.5478	19.1607	18.8385	(90)	
Living area fraction	19.2058	19.3371	19.5601	19.8455	20.0910	20.2192	20.2496	20.2461	20.1745	19.8824	19.4906	19.1674	(92)	
Temperature adjustment	19.2058	19.3371	19.5601	19.8455	20.0910	20.2192	20.2496	20.2461	20.1745	19.8824	19.4906	19.1674	(93)	
adjusted MIT	19.2058	19.3371	19.5601	19.8455	20.0910	20.2192	20.2496	20.2461	20.1745	19.8824	19.4906	19.1674	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9855	0.9778	0.9599	0.9133	0.8082	0.6251	0.4429	0.4887	0.7413	0.9234	0.9751	0.9879	(94)
Ext temp.	515.7923	553.6401	578.1403	583.0474	533.9337	402.5837	272.5085	285.3187	409.8045	480.0727	488.5059	495.9666	(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	1129.1467	1091.7911	987.6560	827.7398	634.5582	424.9467	275.9987	290.8581	459.3791	701.9717	937.0289	1131.8981	(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 per m ²	456.3357	361.6375	304.6797	176.1785	74.8646	0.0000	0.0000	0.0000	0.0000	165.0929	322.9366	473.1330	(98)
												2334.8585	(98)
												38.4023	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2574.2651 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	456.3357	361.6375	304.6797	176.1785	74.8646	0.0000	0.0000	0.0000	0.0000	165.0929	322.9366	473.1330	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	503.1265	398.7183	335.9202	194.2431	82.5409	0.0000	0.0000	0.0000	0.0000	182.0208	356.0491	521.6461	(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	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965	(64)
Efficiency of water heater (217)m	89.6888	89.6101	89.4364	89.0562	88.3047	87.0000	87.0000	87.0000	87.0000	88.9629	89.4975	89.7338	(216)
Fuel for water heating, kWh/month	183.5391	161.6459	169.4711	151.7060	149.3007	134.4899	128.2976	141.9822	142.1121	157.5248	166.6493	178.7470	(219)
Water heating fuel used												1865.4658	(219)
Annual totals kWh/year													
Space heating fuel - main system												2574.2651	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4900)													
mechanical ventilation fans (SFP = 0.4900)												97.4079	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												172.4079	(231)
Electricity for lighting (calculated in Appendix L)												294.6388	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												4906.7777	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2574.2651	3.4800	89.5844 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1865.4658	3.4800	64.9182 (247)
Mechanical ventilation fans	97.4079	13.1900	12.8481 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	294.6388	13.1900	38.8629 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			336.1061 (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] = 1.3343 (257)
SAP value	81.3871
SAP rating (Section 12)	81 (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	2574.2651	0.2160	556.0413 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1865.4658	0.2160	402.9406 (264)
Space and water heating			958.9819 (265)
Pumps and fans	172.4079	0.5190	89.4797 (267)
Energy for lighting	294.6388	0.5190	152.9175 (268)
Energy saving/generation technologies			
PV Unit	-700.0300	0.5190	-363.3156 (269)
Total kg/year			838.0636 (272)
CO2 emissions per m2			13.7800 (273)
EI value			89.3856
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency $3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4

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Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8852 = 3.931$, stars = 4
Water heating environmental impact	$0.216 / 0.8852 = 0.2440$, 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	60.8000 (1b)	x 2.6800 (2b)	= 162.9440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 162.9440 (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					4.2800
Infiltration rate					0.2140 (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) =				0.1980 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2326	0.2177	0.2177	0.1980	0.2029	0.1930	0.1930	0.1881	0.1881	0.2029	0.1980	0.2029 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.6300	1.1450	9.8817		(27)
Heat Loss Floor 1			60.8000	0.1200	7.2960		(28a)
Ground Floor Walls	69.1500	8.6300	60.5200	0.2700	16.3404		(29a)
Wall to Corridor	7.1800	2.1200	5.0600	0.2041	1.0327		(29a)
Total net area of external elements Aum(A, m ²)				137.1300			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.8827		(33)
Party Wall 1				9.2500	0.0000	0.0000	(32)
Party Ceilings 1				60.5800			(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.8556 (36)
Total fabric heat loss							(33) + (36) = 48.7383 (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	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858	26.8858 (38)
Heat transfer coeff	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241	75.6241 (39)
Average = Sum(39)m / 12 =												75.6241 (39)
HLP	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438	1.2438 (40)
HLP (average)												1.2438 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0042 (42)
Average daily hot water use (litres/day)												81.7988 (43)
Daily hot water use	89.9787	86.7068	83.4348	80.1628	76.8909	73.6189	73.6189	76.8909	80.1628	83.4348	86.7068	89.9787 (44)
Energy conte	133.4358	116.7038	120.4279	104.9920	100.7423	86.9329	80.5561	92.4393	93.5434	109.0158	118.9992	129.2255 (45)
Energy content (annual)												Total = Sum(45)m = 1287.0140 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0154	17.5056	18.0642	15.7488	15.1113	13.0399	12.0834	13.8659	14.0315	16.3524	17.8499	19.3838 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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	31.1782	28.1472	31.1410	30.1116	31.0973	30.0733	31.0628	31.0851	30.0942	31.1229	30.1477	31.1710	(61)
Total heat required for water heating calculated for each month	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965	(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	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965	(64)
Heat gains from water heating, kWh/month	52.1620	45.8408	47.8275	42.4377	41.2711	36.4235	34.5506	38.5074	38.6267	44.0285	47.1042	50.7602	(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	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	120.2497	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.7092	37.0457	30.1276	22.8085	17.0496	14.3940	15.5533	20.2167	27.1348	34.4539	40.2128	42.8684	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.1343	263.8440	257.0155	242.4785	224.1280	206.8812	195.3593	192.6495	199.4780	214.0151	232.3655	249.6123	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	49.0291	(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)	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	-80.1664	(71)
Water heating gains (Table 5)	70.1102	68.2155	64.2843	58.9413	55.4719	50.5882	46.4390	51.7572	53.6482	59.1781	65.4225	68.2261	(72)
Total internal gains	465.0659	461.2176	443.5398	416.3406	388.7620	363.9758	349.4639	356.7358	372.3734	399.7594	430.1131	452.8192	(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		
Southeast				3.6600	45.0642	0.6300	0.7000	0.7700		50.4062 (77)		
Northwest				4.9700	14.6130	0.6300	0.7000	0.7700		22.1957 (81)		

Solar gains	72.6019	111.7819	173.2641	244.7045	282.5222	322.1173	293.6934	261.5155	206.6864	138.3399	88.0684	57.9616 (83)
Total gains	537.6679	572.9994	616.8039	661.0452	671.2841	686.0931	643.1573	618.2513	579.0598	538.0992	518.1816	510.7808 (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	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317	55.8317		
alpha	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221	4.7221		
util living area	0.9858	0.9799	0.9601	0.9026	0.7740	0.5453	0.3853	0.3886	0.6775	0.9035	0.9719	0.9881		(86)
MIT	20.0363	20.1300	20.3604	20.6543	20.8817	20.9825	20.9973	20.9973	20.9527	20.7162	20.3407	20.0093		(87)
Th 2	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851	19.8851		(88)
util rest of house	0.9810	0.9731	0.9463	0.8683	0.6999	0.4341	0.2566	0.2547	0.5654	0.8602	0.9605	0.9840		(89)
MIT 2	19.0455	19.1372	19.3606	19.6330	19.8193	19.8798	19.8848	19.8848	19.8672	19.6939	19.3449	19.0193		(90)
Living area fraction	19.3752	19.4676	19.6932	19.9728	20.1728	20.2467	20.2550	20.2550	20.2284	20.0341	19.6762	19.3487		(92)
Temperature adjustment	19.3752	19.4676	19.6932	19.9728	20.1728	20.2467	20.2550	20.2550	20.2284	20.0341	19.6762	19.3487		(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	525.9505	555.7833	581.8729	576.0554	483.7609	323.3303	192.7551	185.2125	348.6771	466.5088	496.3195	501.3012	(94)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	1041.7348	1018.4713	914.5400	746.6237	534.8762	328.7134	193.2176	185.6561	365.1406	600.0059	837.6278	1032.1684	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	383.7435	310.9263	247.5043	122.8091	38.0298	0.0000	0.0000	0.0000	0.0000	99.3218	245.7420	394.9651	(98)
Space heating												1843.0420	(98)
Space heating per m2												30.3132	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2032.0198 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	383.7435	310.9263	247.5043	122.8091	38.0298	0.0000	0.0000	0.0000	0.0000	99.3218	245.7420	394.9651	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	423.0910	342.8074	272.8824	135.4015	41.9292	0.0000	0.0000	0.0000	0.0000	109.5059	270.9394	435.4632	(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	164.6140	144.8510	151.5689	135.1036	131.8395	117.0062	111.6189	123.5245	123.6375	140.1387	149.1470	160.3965	(64)
Efficiency of water heater (217)m	89.5566	89.4904	89.2583	88.7234	87.8019	87.0000	87.0000	87.0000	87.0000	88.4974	89.2661	87.0000	(216)
Fuel for water heating, kWh/month	183.8100	161.8620	169.8094	152.2750	150.1557	134.4899	128.2976	141.9822	142.1121	158.3535	167.0813	179.0150	(219)
Water heating fuel used												1869.2436	(219)
Annual totals kWh/year													
Space heating fuel - main system												2032.0198	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4900)													
mechanical ventilation fans (SFP = 0.4900)													97.4079 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													172.4079 (231)
Electricity for lighting (calculated in Appendix L)													294.6388 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4368.3101 (238)

10a. Fuel costs - using BEDF prices (500)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2032.0198	3.6300	73.7623 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1869.2436	3.6300	67.8535 (247)
Mechanical ventilation fans	97.4079	19.4400	18.9361 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	294.6388	19.4400	57.2778 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	19.4400	0.0000 (252)
Total energy cost			327.4097 (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	2032.0198	0.2160	438.9163 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1869.2436	0.2160	403.7566 (264)
Space and water heating			842.6729 (265)
Pumps and fans	172.4079	0.5190	89.4797 (267)
Energy for lighting	294.6388	0.5190	152.9175 (268)
Energy saving/generation technologies			
PV Unit	-700.0300	0.5190	-363.3156 (269)
Total kg/year			721.7546 (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	2032.0198	1.2200	2479.0642 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1869.2436	1.2200	2280.4772 (264)
Space and water heating			4759.5414 (265)
Pumps and fans	172.4079	3.0700	529.2923 (267)
Energy for lighting	294.6388	3.0700	904.5411 (268)
Energy saving/generation technologies			
PV Unit	-700.0300	3.0700	-2149.0921 (269)
Primary energy kWh/year			4044.2827 (272)
Primary energy kWh/m2/year			66.5178 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 81
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 81
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 500 TEST (30 Jun 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£91	£91	£0
Mains gas	£237	£237	£0
Space heating	£202	£202	£0
Water heating	£68	£68	£0
Lighting	£57	£57	£0
Total cost of fuels	£328	£328	£0
Total cost of uses	£327	£327	£0
Delivered energy	72 kWh/m²	72 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	67 kWh/m²	67 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 0647 Flat 94	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	9 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	16.09	TER	20.95
Environmental	89 B	% DER<TER	23.19		
CO ₂ Emissions (t/year)	0.72	DFEE	55.10	TFEE	57.90
General Requirements Compliance	Pass	% DFEE<TFEE	4.84		

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

Building Elements

Wall Ground Floor Flats

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	102.5	0.7700	0.1331	82.81		
	Main construction	102.5	0.9407	0.1090	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Hemelite standard solid *7.3N						
	Main construction	140	0.4700	0.2979	93.43	1450	1000
	Main construction	140	0.8803	0.1590	6.57	1450	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 = 3.758 m ² K/W	Lower limit = 3.751 m ² K/W	Average = 3.754 m ² K/W
	Total correction = 0.0062 m ² K/W	U-value (unrounded) = 0.27 W/m ² K	

Unheated space: None

Total thickness: 370 mm

U-value: 0.27 W/m² K

Kappa: 113.50 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Flat 94	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	9 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	16.09	TER	20.95
Environmental	89 B	% DER<TER	23.19		
CO ₂ Emissions (t/year)	0.72	DFEE	55.10	TFEE	57.90
General Requirements Compliance	Pass	% DFEE<TFEE	4.84		

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 Wall to Corridor

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	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00		
Layer 2	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 3	Hemelite standard solid *7.3N						
	Main construction	100	0.4700	0.2128	93.43		
	Main construction	100	0.8803	0.1136	6.57		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 5	Hemelite standard solid *7.3N						
	Main construction	100	0.4700	0.2128	93.43	1450	1000
	Main construction	100	0.8803	0.1136	6.57	1450	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 6	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 7	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 3.982 m ² K/W	Lower limit = 3.973 m ² K/W	Average = 3.978 m ² K/W
	Total correction = 0.0055 m ² K/W	U-value (unrounded) = 0.25 W/m ² K	

U-VALUE CALCULATOR REPORT

Unheated space: None

Total thickness: 355 mm

U-value: 0.25 W/m² K

Kappa: 113.50 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Flat 94	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	9 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	16.09	TER	20.95
Environmental	89 B	% DER<TER	23.19		
CO ₂ Emissions (t/year)	0.72	DFEE	55.10	TFEE	57.90
General Requirements Compliance	Pass	% DFEE<TFEE	4.84		

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 = 71.49 m², Perimeter = 41.78 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 94	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Property	9 Haines Crescent, WEST END, SO30 3LG		
SAP Rating	81 B	DER	16.09
Environmental	89 B	TER	20.95
CO ₂ Emissions (t/year)	0.72	% DER<TER	23.19
General Requirements Compliance	Pass	DfEE	55.10
		TFEE	57.90
		% DfEE<TFEE	4.84
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 East			
Property Tenure	Unknown			
Transaction Type	New dwelling			
Terrain Type	Suburban			
1.0 Property Type	Flat, Semi-Detached			
2.0 Number of Storeys	1			
3.0 Date Built	2020			
4.0 Sheltered Sides	1			
5.0 Sunlight/Shade	Average or unknown			
6.0 Measurements				
	Ground Floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
		28.48 m	60.80 m²	2.68 m
7.0 Living Area	20.23	m²		
8.0 Thermal Mass Parameter	Simple calculation - Medium			
Thermal Mass	250.00	kJ/m²K		
9.0 External Walls				
Description	Type		U-Value (W/m²K)	Gross Area (m²) Nett Area (m²)
Ground Floor Walls	Cavity Wall		0.27	69.15 60.52
Wall to Corridor	Cavity Wall		0.25	7.18 5.06
9.1 Party Walls				
Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Filled Cavity with Edge Sealing		0.00	9.25
10.1 Party Ceilings				
Description	Construction			Area (m²)
11.0 Heat Loss Floors				
Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid		0.12	60.80
12.0 Opening Types				

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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
Flat Entrance Door	Solid Door	[2] Wall to Corridor	North East							2.12	
North West	Window	[1] Ground Floor Walls	North West	None	0.00					4.97	
South West	Window	[1] Ground Floor Walls	South East	None	0.00					3.66	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

Yes

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	7.64	0.300	No
Table K1 - Approved	E3 Sill	6.63	0.040	No
Table K1 - Approved	E4 Jamb	19.80	0.050	No
Table K1 - Approved	E5 Ground floor (normal)	28.48	0.160	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	28.48	0.070	No
Table K1 - Approved	E16 Corner (normal)	8.04	0.090	No
Table K1 - Approved	E18 Party wall between dwellings	2.68	0.060	No
Table K1 - Default	E25 Staggered party wall between dwellings	2.68	0.120	No
Table K1 - Default	P1 Party wall - Ground floor	3.45	0.160	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.45	0.000	No

Y-value	0.086	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	Yes	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	4.28	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500233
Configuration	1
Manufacturer SFP	0.35

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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	8	
Total number of L.E.L. fittings	8	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted No

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
Percentage of Heat	Gas Combi	%
Database Ref. No.	100	
Fuel Type	17503	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.7	
Controls	87.0	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
Fan Assisted Flue	Balanced	
Is MHS Pumped	Yes	
Heat Emitter	Pump in heated space	
Flow Temperature	Radiators	
Combi boiler type	Normal (> 45°C)	
Combi keep hot type	Standard Combi	
	Gas/Oil, time clock	

25.0 Main Heating 2

None

Community Heating None

28.0 Water Heating

Water Heating	HWP From main heating 1
Flue Gas Heat Recovery System	Main Heating 1
Waste Water Heat Recovery	No
	No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Instantaneous System 1

Waste Water Heat Recovery

No

Instantaneous System 2

Waste Water Heat Recovery

No

Storage System

Solar Panel

No

Water use <= 125 litres/person/day

Yes

SAP Code

901

29.0 Hot Water Cylinder

None

32.0 Photovoltaic Unit

More Dwellings, One Block

Apportioned

700.03

kWh/Year

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

BLOCK COMPLIANCE

Calculation Type: New Build (As Built)

Block Reference	SAP 0647	Issued on Date	02/08/2022
Block Name	Moorgreen 92-100		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID E477-0001
Client	Foreman Homes, FORE		

Block Compliance Report - DER

Block Reference: SAP 0647		Block Name: Moorgreen 92-100			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
SAP 0647 Flat 92-As Built	1	71.26	17.06	21.57	20.92 %
SAP 0647 Flat 93-As Built	1	63.01	17.57	22.24	20.99 %
SAP 0647 Flat 94-As Built	1	60.8	16.09	20.95	23.19 %
SAP 0647 Flat 95-As Built	1	62	13.38	18.55	27.86 %
SAP 0647 Flat 96-As Built	1	62.8	13.72	18.87	27.29 %
SAP 0647 Flat 97-As Built	1	60.66	12.30	17.63	30.24 %
SAP 0647 Flat 98-As Built	1	65.7	12.49	18.12	31.06 %
SAP 0647 Flat 99-As Built	1	54.62	14.23	19.87	28.37 %
SAP 0647 Flat 100-As Built	1	69.78	11.78	17.64	33.22 %
Totals:	9	570.63	128.62	175.43	
Average DER = 14.30 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 19.49 kgCO ₂ /m ²		26.63 %			

Block Compliance Report - DFEE

Block Reference: SAP 0647		Block Name: Moorgreen 92-100			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
SAP 0647 Flat 92-As Built	1	71.26	61.49	64.19	4.21 %
SAP 0647 Flat 93-As Built	1	63.01	61.71	65.13	5.24 %
SAP 0647 Flat 94-As Built	1	60.8	55.10	57.90	4.84 %
SAP 0647 Flat 95-As Built	1	62	44.33	45.09	1.68 %
SAP 0647 Flat 96-As Built	1	62.8	46.14	47.46	2.77 %
SAP 0647 Flat 97-As Built	1	60.66	39.75	40.54	1.95 %
SAP 0647 Flat 98-As Built	1	65.7	41.07	43.41	5.38 %
SAP 0647 Flat 99-As Built	1	54.62	44.64	47.18	5.39 %
SAP 0647 Flat 100-As Built	1	69.78	39.42	42.80	7.88 %
Totals:	9	570.63	433.66	453.69	
Average DFEE = 48.31 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 50.55 kWh/m ² /yr		4.43 %			