



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 11 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 95	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Property	11 Haines Crescent, WEST END, SO30 3LG		
SAP Rating	83 B	DER	13.38
Environmental	91 B	TER	18.55
CO ₂ Emissions (t/year)	0.59	% DER<TER	27.86
General Requirements Compliance	Pass	DfEE	44.33
		TfEE	45.09
		% DfEE<TfEE	1.68
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TfEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.55	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.38	kgCO ₂ /m ²	Pass
	-5.17 (-27.9%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	45.09	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	44.33	kWh/m ² /yr	
	-0.8 (-1.8%)	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
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	4.24 (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

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
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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)

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 North East

5.24 m², No overhang

Windows facing South West

2.52 m², No overhang

Air change rate

3.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.24 (measured in this dwelling)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Door U-value

1.10

W/m²K

Photovoltaic array

713.84

kWh/Year

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THERMAL BRIDGING

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Environmental	91 B	TER	18.55
CO ₂ Emissions (t/year)	0.59	% DER<TER	27.86
General Requirements Compliance	Pass	DFEE	44.33
		TFEE	45.09
		% DFEE<TFEE	1.68
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	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	7.20	2.16	
External wall	E3 Sill	Table K1 - Approved	0.040	6.29	0.25	
External wall	E4 Jamb	Table K1 - Approved	0.050	16.50	0.83	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	69.92	4.89	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	14.30	1.29	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	4.77	-0.43	

Total: **8.99** W/mK:
Y-Value: **0.108** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	91 B	% DER<TER	27.86		
CO ₂ Emissions (t/year)	0.59	DFEE	44.33	TFEE	45.09
General Requirements Compliance	Pass	% DFEE<TFEE	1.68		
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

Mid-floor flat, total floor area 62 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.55 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.38 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.27 (max. 0.70)	OK
Floor (no floor)			
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:	4.24 (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
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5 Cylinder insulation

Hot water storage	No cylinder
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6 Controls

Space heating controls:	Programmer, room thermostat and TRVs	OK
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Hot water controls:	No cylinder
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Boiler interlock	Yes	OK
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7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system	
Specific fan power:	0.35
Maximum	0.7

9 Summertime temperature

Overheating risk (Southern England):	Slight	OK
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Based on:

Overshading:	Average
Windows facing North East:	5.24 m ² , No overhang
Windows facing South West:	2.52 m ² , No overhang
Air change rate:	3.00 ach
Blinds/curtains:	None

10 Key features

Door U-value	1.10 W/m ² K
Photovoltaic array	713.84 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	62.0000 (1b)	x 2.3800 (2b)	= 147.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.5600 (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					4.2400
Infiltration rate					0.2120 (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) =				0.1961 (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	0.2500	0.2451	0.2402	0.2157	0.2108	0.1863	0.1863	0.1814	0.1961	0.2108	0.2206	0.2304 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			7.7600	1.1450	8.8855		(27)
Ground Floor Walls	64.5100	7.7600	56.7500	0.2700	15.3225		(29a)
Wall to Corridor	14.5400		14.5400	0.2041	2.9673		(29a)
Wall to Corridor	4.1500	2.1200	2.0300	0.2320	0.4710		(29a)
Total net area of external elements Aum(A, m2)			83.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9783		(33)
Party Floor 1			61.5800				(32d)
Party Ceilings 1			53.8200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9887 (36)
Total fabric heat loss							(33) + (36) = 38.9670 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.3487	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474 (38)
Average = Sum(39)m / 12 =	63.3158	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144 (39)
	63.3158	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3146 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												2.0376 (42)
												82.5925 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	90.8518	87.5481	84.2444	80.9407	77.6370	74.3333	74.3333	77.6370	80.9407	84.2444	87.5481	90.8518 (44)
Energy content (annual)	134.7306	117.8362	121.5964	106.0107	101.7198	87.7765	81.3378	93.3363	94.4510	110.0736	120.1539	130.4794 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1299.5023 (45)
	20.2096	17.6754	18.2395	15.9016	15.2580	13.1665	12.2007	14.0004	14.1677	16.5110	18.0231	19.5719 (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	31.1827	28.1509	31.1447	30.1147	31.1001	30.0757	31.0650	31.0878	30.0970	31.1263	30.1516	31.1753	(61)
Total heat required for water heating calculated for each month	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	161.6547	(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	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	161.6547	(64)
Heat gains from water heating, kWh/month	52.5936	46.2183	48.2170	42.7772	41.5969	36.7046	34.8111	38.8063	38.9292	44.3810	47.4891	51.1782	(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	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4463	15.4957	12.6019	9.5405	7.1316	6.0208	6.5057	8.4564	11.3501	14.4116	16.8204	17.9312	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.9613	179.8080	175.1544	165.2475	152.7418	140.9882	133.1361	131.2894	135.9430	145.8499	158.3556	170.1092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	(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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)
Water heating gains (Table 5)	70.6903	68.7772	64.8078	59.4128	55.9098	50.9786	46.7891	52.1590	54.0683	59.6519	65.9570	68.7879	(72)
Total internal gains	322.6617	320.6446	309.1279	290.7645	272.3469	254.5513	242.9946	248.4684	257.9251	276.4771	297.6968	313.3921	(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			
Northeast				5.2400	11.2829	0.6300	0.7000	0.7700	18.0686 (75)			
Southwest				2.5200	36.7938	0.6300	0.7000	0.7700	28.3366 (79)			
Solar gains	46.4052	85.0469	132.3064	190.6545	237.9381	246.9454	233.6172	196.7014	152.2538	98.2932	56.6757	39.0060 (83)
Total gains	369.0669	405.6915	441.4343	481.4190	510.2850	501.4967	476.6118	445.1699	410.1789	374.7703	354.3725	352.3980 (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	68.0013	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	
alpha	5.5334	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	
util living area	0.9981	0.9963	0.9909	0.9701	0.9006	0.7446	0.5717	0.6312	0.8723	0.9805	0.9961	0.9985	(86)
MIT	19.9312	20.0458	20.2544	20.5361	20.7995	20.9506	20.9905	20.9841	20.8774	20.5486	20.1824	19.8959	(87)
Th 2	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	(88)
util rest of house	0.9974	0.9951	0.9876	0.9586	0.8623	0.6599	0.4570	0.5145	0.8100	0.9708	0.9945	0.9980	(89)
MIT 2	19.0883	19.2025	19.4097	19.6849	19.9266	20.0423	20.0632	20.0609	19.9952	19.7004	19.3390	19.0531	(90)
Living area fraction	19.4846	19.5990	19.8068	20.0851	20.3370	20.4694	20.4992	20.4950	20.4099	20.0992	19.7355	19.4493	(91)
MIT	19.4846	19.5990	19.8068	20.0851	20.3370	20.4694	20.4992	20.4950	20.4099	20.0992	19.7355	19.4493	(92)
Temperature adjustment	19.4846	19.5990	19.8068	20.0851	20.3370	20.4694	20.4992	20.4950	20.4099	20.0992	19.7355	19.4493	(93)
adjusted MIT	19.4846	19.5990	19.8068	20.0851	20.3370	20.4694	20.4992	20.4950	20.4099	20.0992	19.7355	19.4493	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9969	0.9943	0.9865	0.9589	0.8747	0.6985	0.5113	0.5698	0.8356	0.9712	0.9938	0.9976	(94)
Ext temp.	367.9273	403.3682	435.4693	461.6136	446.3247	350.2795	243.7073	253.6693	342.7308	363.9693	352.1816	351.5503	(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	961.4257	930.6560	842.5154	708.1799	546.8471	371.6149	246.8742	259.2705	399.5101	601.4350	800.0126	965.5021	(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	441.5628	354.3374	302.8423	177.5277	74.7886	0.0000	0.0000	0.0000	0.0000	176.6744	322.4383	456.7802	(98)
												2306.9517	(98)
												37.2089	(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													2543.4970 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	441.5628	354.3374	302.8423	177.5277	74.7886	0.0000	0.0000	0.0000	0.0000	176.6744	322.4383	456.7802	(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)	486.8388	390.6697	333.8945	195.7307	82.4571	0.0000	0.0000	0.0000	0.0000	194.7899	355.4998	503.6165	(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	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	161.6547	(64)
Efficiency of water heater (217)m	89.6586	89.5883	89.4249	89.0562	88.2976	87.0000	87.0000	87.0000	87.0000	89.0183	89.4899	89.7028	(216)
Fuel for water heating, kWh/month	185.0501	162.9534	170.8038	152.8533	150.4231	135.4622	129.1986	143.0162	143.1586	158.6189	167.9580	180.2114	(219)
Water heating fuel used												1879.7075	(219)
Annual totals kWh/year													
Space heating fuel - main system												2543.4970	(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)													88.2114 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													163.2114 (231)
Electricity for lighting (calculated in Appendix L)													308.1080 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4894.5238 (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	2543.4970	0.2160	549.3953 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1879.7075	0.2160	406.0168 (264)
Space and water heating			955.4122 (265)
Pumps and fans	163.2114	0.5190	84.7067 (267)
Energy for lighting	308.1080	0.5190	159.9080 (268)
Energy saving/generation technologies			
PV Unit	-713.8400	0.5190	-370.4830 (269)
Total CO2, kg/year			829.5439 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.3800 (273)

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

DER			13.3800 ZC1
Total Floor Area		TFA	62.0000
Assumed number of occupants		N	2.0376
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.0091 ZC2
CO2 emissions from cooking, equation (L16)			2.7081 ZC3
Total CO2 emissions			33.0972 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			33.0972 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.0000 (1b)	x 2.3800 (2b)	= 147.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.5600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1355 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3855 (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) =				0.3566 (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	0.4547	0.4458	0.4369	0.3923	0.3834	0.3388	0.3388	0.3299	0.3566	0.3834	0.4012	0.4190 (22b)
Effective ac	0.6034	0.5994	0.5954	0.5769	0.5735	0.5574	0.5574	0.5544	0.5636	0.5735	0.5805	0.5878 (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)			7.7600	1.3258	10.2879		(27)
Ground Floor Walls	64.5100	7.7600	56.7500	0.1800	10.2150		(29a)
Wall to Corridor	14.5400		14.5400	0.1800	2.6172		(29a)
Wall to Corridor	4.1500	2.1200	2.0300	0.1800	0.3654		(29a)
Total net area of external elements Aum(A, m ²)			83.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.6055		(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)							7.2516 (36)
Total fabric heat loss						(33) + (36) =	32.8571 (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	29.3811	29.1857	28.9941	28.0942	27.9258	27.1420	27.1420	26.9968	27.4439	27.9258	28.2664	28.6225 (38)
Heat transfer coeff	62.2382	62.0428	61.8512	60.9512	60.7829	59.9991	59.9991	59.8539	60.3010	60.7829	61.1235	61.4796 (39)
Average = Sum(39)m / 12 =												60.9504 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0038	1.0007	0.9976	0.9831	0.9804	0.9677	0.9677	0.9654	0.9726	0.9804	0.9859	0.9916 (40)
HLP (average)												0.9831 (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												2.0376 (42)
Average daily hot water use (litres/day)												82.5925 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.8518	87.5481	84.2444	80.9407	77.6370	74.3333	74.3333	77.6370	80.9407	84.2444	87.5481	90.8518 (44)
Energy conte	134.7306	117.8362	121.5964	106.0107	101.7198	87.7765	81.3378	93.3363	94.4510	110.0736	120.1539	130.4794 (45)
Energy content (annual)										Total = Sum(45)m =		1299.5023 (45)
Distribution loss (46)m = 0.15 x (45)m	20.2096	17.6754	18.2395	15.9016	15.2580	13.1665	12.2007	14.0004	14.1677	16.5110	18.0231	19.5719 (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	46.2971	40.2961	42.9300	39.9160	39.5630	36.6575	37.8794	39.5630	39.9160	42.9300	43.1744	46.2971 (61)
Total heat required for water heating calculated for each month	181.0277	158.1323	164.5265	145.9267	141.2828	124.4340	119.2172	132.8993	134.3670	153.0036	163.3283	176.7765 (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	181.0277	158.1323	164.5265	145.9267	141.2828	124.4340	119.2172	132.8993	134.3670	153.0036	163.3283	176.7765 (64)
Heat gains from water heating, kWh/month	56.3722	49.2546	51.1633	45.2276	43.7126	38.3501	36.5147	40.9251	41.3840	47.3320	50.7448	54.9587 (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	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4463	15.4957	12.6019	9.5405	7.1316	6.0208	6.5057	8.4564	11.3501	14.4116	16.8204	17.9312 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.9613	179.8080	175.1544	165.2475	152.7418	140.9882	133.1361	131.2894	135.9430	145.8499	158.3556	170.1092 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879 (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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032 (71)
Water heating gains (Table 5)	75.7691	73.2955	68.7679	62.8160	58.7535	53.2640	49.0789	55.0068	57.4777	63.6182	70.4789	73.8692 (72)
Total internal gains	327.7405	325.1629	313.0880	294.1678	275.1906	256.8367	245.2844	251.3163	261.3345	280.4434	302.2186	318.4733 (73)

6. Solar gains

[Jan]														
	Area m2				Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF Access factor Table 6d		Gains W	
Northeast	5.2400				11.2829		0.6300		0.7000		0.7700		18.0686 (75)	
Southwest	2.5200				36.7938		0.6300		0.7000		0.7700		28.3366 (79)	
Solar gains	46.4052	85.0469	132.3064	190.6545	237.9381	246.9454	233.6172	196.7014	152.2538	98.2932	56.6757	39.0060 (83)		
Total gains	374.1457	410.2098	445.3944	484.8222	513.1287	503.7821	478.9016	448.0177	413.5883	378.7366	358.8943	357.4793 (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	69.1786	69.3966	69.6116	70.6393	70.8350	71.7604	71.7604	71.9344	71.4011	70.8350	70.4403	70.0323
alpha	5.6119	5.6264	5.6408	5.7093	5.7223	5.7840	5.7840	5.7956	5.7601	5.7223	5.6960	5.6688
util living area	0.9979	0.9960	0.9902	0.9668	0.8891	0.7174	0.5432	0.5999	0.8546	0.9779	0.9957	0.9984 (86)
MIT	19.9636	20.0808	20.2898	20.5801	20.8296	20.9646	20.9940	20.9897	20.9020	20.5908	20.2314	19.9457 (87)
Th 2	20.0801	20.0828	20.0853	20.0975	20.0997	20.1103	20.1103	20.1123	20.1062	20.0997	20.0951	20.0903 (88)
util rest of house	0.9972	0.9947	0.9867	0.9543	0.8491	0.6353	0.4377	0.4916	0.7902	0.9673	0.9940	0.9979 (89)
MIT 2	18.6920	18.8651	19.1707	19.5944	19.9283	20.0861	20.1080	20.1078	20.0251	19.6165	19.0945	18.6734 (90)
Living area fraction										fLA = Living area / (4) =		0.4702 (91)
MIT	19.2898	19.4367	19.6969	20.0578	20.3521	20.4992	20.5245	20.5225	20.4374	20.0746	19.6290	19.2716 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2898	19.4367	19.6969	20.0578	20.3521	20.4992	20.5245	20.5225	20.4374	20.0746	19.6290	19.2716 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9935	0.9848	0.9536	0.8615	0.6727	0.4875	0.5428	0.8164	0.9669	0.9929	0.9972 (94)
Useful gains	372.8134	407.5380	438.6332	462.3414	442.0595	338.9092	233.4807	243.1890	337.6506	366.2028	356.3346	356.4851 (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	932.9414	901.8947	816.2433	680.0837	525.8973	353.9443	235.4682	246.7454	382.1501	575.8930	765.8151	926.5956 (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	416.7352	332.2077	280.9419	156.7745	62.3753	0.0000	0.0000	0.0000	0.0000	156.0095	294.8259	424.1622 (98)
Space heating												2124.0322 (98)
Space heating per m2										(98) / (4) =		34.2586 (99)

8c. Space cooling requirement

Not applicable

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

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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												2274.1244	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	416.7352	332.2077	280.9419	156.7745	62.3753	0.0000	0.0000	0.0000	0.0000	156.0095	294.8259	424.1622	(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)	446.1833	355.6828	300.7943	167.8528	66.7830	0.0000	0.0000	0.0000	0.0000	167.0337	315.6594	454.1351	(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	181.0277	158.1323	164.5265	145.9267	141.2828	124.4340	119.2172	132.8993	134.3670	153.0036	163.3283	176.7765	(64)
Efficiency of water heater	87.0829	86.8761	86.3870	85.2319	83.1451	80.3000	80.3000	80.3000	80.3000	85.1002	86.5205	87.1746	(216)
(217)m	87.0829	86.8761	86.3870	85.2319	83.1451	80.3000	80.3000	80.3000	80.3000	85.1002	86.5205	87.1746	(217)
Fuel for water heating, kWh/month	207.8796	182.0206	190.4529	171.2113	169.9231	154.9614	148.4648	165.5034	167.3313	179.7923	188.7741	202.7845	(219)
Water heating fuel used	207.8796	182.0206	190.4529	171.2113	169.9231	154.9614	148.4648	165.5034	167.3313	179.7923	188.7741	2129.0993	(219)
Annual totals kWh/year													
Space heating fuel - main system												2274.1244	(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)												308.1080	(232)
Total delivered energy for all uses												4786.3316	(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	2274.1244	0.2160	491.2109	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2129.0993	0.2160	459.8854	(264)
Space and water heating			951.0963	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	308.1080	0.5190	159.9080	(268)
Total CO2, kg/m2/year			1149.9293	(272)
Emissions per m2 for space and water heating			15.3403	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.5792	(272b)
Emissions per m2 for pumps and fans			0.6278	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3403 * 1.00) + 2.5792 + 0.6278, rounded to 2 d.p.			18.5500	(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	62.0000 (1b)	x 2.3800 (2b)	= 147.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.5600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1355 (8)
Pressure test					Yes
Measured/design AP50					4.2400
Infiltration rate					0.3475 (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) =				0.3215 (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	0.4099	0.4018	0.3938	0.3536	0.3456	0.3054	0.3054	0.2974	0.3215	0.3456	0.3617	0.3777 (22b)
	0.5840	0.5807	0.5775	0.5625	0.5597	0.5466	0.5466	0.5442	0.5517	0.5597	0.5654	0.5713 (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)			7.7600	1.1450	8.8855		(27)
Ground Floor Walls	64.5100	7.7600	56.7500	0.2700	15.3225		(29a)
Wall to Corridor	14.5400		14.5400	0.2041	2.9673		(29a)
Wall to Corridor	4.1500	2.1200	2.0300	0.2320	0.4710		(29a)
Total net area of external elements Aum(A, m ²)			83.2000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 29.9783		(33)
Party Floor 1			61.5800				(32d)
Party Ceilings 1			53.8200				(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)							8.9887 (36)
Total fabric heat loss						(33) + (36) =	38.9670 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.4378	28.2789	28.1232	27.3920	27.2552	26.6182	26.6182	26.5003	26.8636	27.2552	27.5319	27.8213 (38)
Heat transfer coeff	67.4048	67.2460	67.0903	66.3590	66.2222	65.5853	65.5853	65.4673	65.8306	66.2222	66.4990	66.7883 (39)
Average = Sum(39)m / 12 =												66.3584 (39)
HLP	1.0872	1.0846	1.0821	1.0703	1.0681	1.0578	1.0578	1.0559	1.0618	1.0681	1.0726	1.0772 (40)
HLP (average)												1.0703 (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												2.0376 (42)
Average daily hot water use (litres/day)												82.5925 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	90.8518	87.5481	84.2444	80.9407	77.6370	74.3333	74.3333	77.6370	80.9407	84.2444	87.5481	90.8518 (44)
Energy content (annual)	134.7306	117.8362	121.5964	106.0107	101.7198	87.7765	81.3378	93.3363	94.4510	110.0736	120.1539	130.4794 (45)
Distribution loss (46)m = 0.15 x (45)m												1299.5023 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(59)
Heat gains from water heating, kWh/month	28.6302	25.0402	25.8392	22.5273	21.6155	18.6525	17.2843	19.8340	20.0708	23.3906	25.5327	(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	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4463	15.4957	12.6019	9.5405	7.1316	6.0208	6.5057	8.4564	11.3501	14.4116	16.8204	17.9312	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.9613	179.8080	175.1544	165.2475	152.7418	140.9882	133.1361	131.2894	135.9430	145.8499	158.3556	170.1092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	(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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)
Water heating gains (Table 5)	38.4815	37.2622	34.7302	31.2879	29.0530	25.9062	23.2316	26.6586	27.8762	31.4390	35.4621	37.2673	(72)
Total internal gains	287.4529	286.1296	276.0502	259.6396	242.4902	226.4790	216.4371	219.9680	228.7330	245.2642	264.2018	278.8714	(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			
Northeast				5.2400	11.2829	0.6300	0.7000	0.7700	18.0686 (75)			
Southwest				2.5200	36.7938	0.6300	0.7000	0.7700	28.3366 (79)			
Solar gains	46.4052	85.0469	132.3064	190.6545	237.9381	246.9454	233.6172	196.7014	152.2538	98.2932	56.6757	39.0060 (83)
Total gains	333.8581	371.1765	408.3567	450.2941	480.4282	473.4244	450.0543	416.6695	380.9867	343.5574	320.8775	317.8774 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	63.8761	64.0270	64.1756	64.8828	65.0168	65.6482	65.6482	65.7665	65.4035	65.0168	64.7462	64.4657		
alpha	5.2584	5.2685	5.2784	5.3255	5.3345	5.3765	5.3765	5.3844	5.3602	5.3345	5.3164	5.2977		
util living area	0.9988	0.9977	0.9940	0.9793	0.9262	0.7884	0.6188	0.6829	0.9067	0.9876	0.9976	0.9991	(86)	
MIT	19.7861	19.9079	20.1305	20.4436	20.7372	20.9283	20.9845	20.9744	20.8325	20.4627	20.0717	19.7651	(87)	
Th 2	20.0113	20.0134	20.0155	20.0252	20.0270	20.0354	20.0354	20.0370	20.0322	20.0270	20.0233	20.0195	(88)	
util rest of house	0.9984	0.9968	0.9918	0.9707	0.8940	0.7046	0.4945	0.5591	0.8530	0.9810	0.9967	0.9988	(89)	
MIT 2	18.8993	19.0226	19.2459	19.5622	19.8395	20.0001	20.0312	20.0290	19.9313	19.5853	19.1943	18.8849	(90)	
Living area fraction									fLA = Living area / (4) =			0.4702	(91)	
MIT	19.3163	19.4389	19.6618	19.9766	20.2616	20.4365	20.4794	20.4735	20.3550	19.9978	19.6068	19.2987	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.3163	19.4389	19.6618	19.9766	20.2616	20.4365	20.4794	20.4735	20.3550	19.9978	19.6068	19.2987	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	333.2016	369.7730	404.5811	436.8561	433.7809	351.2872	249.1383	257.4626	332.8258	336.9355	319.6281	317.3966	(94)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	1012.1684	977.6794	883.0310	735.0341	566.9665	382.7911	254.4296	266.6812	411.7700	622.3425	831.6882	1008.4192	(97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)	
Space heating kWh	505.1513	408.5131	355.9667	214.6881	99.0901	0.0000	0.0000	0.0000	0.0000	212.3428	368.6833	514.1208	(98)	
Space heating												2678.5563	(98)	
Space heating per m2										(98) / (4) =		43.2025	(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	616.5017	485.3311	497.5518	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8522	0.9182	0.8909	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	525.3745	445.6201	443.2679	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	630.0406	601.2802	563.6792	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	75.3596	115.8111	89.5861	0.0000	0.0000	0.0000	0.0000	(104)	
Space cooling												280.7568	(104)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	18.8399	28.9528	22.3965	0.0000	0.0000	0.0000 (107)
Space cooling											70.1892 (107)
Space cooling per m2											1.1321 (108)
Energy for space heating											43.2025 (99)
Energy for space cooling											1.1321 (108)
Total											44.3346 (109)
Dwelling Fabric Energy Efficiency (DFEE)											44.3 (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	62.0000 (1b)	x 2.3800 (2b)	= 147.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.5600 (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) = 0.1355 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3855 (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) =				0.3566 (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	0.4547	0.4458	0.4369	0.3923	0.3834	0.3388	0.3388	0.3299	0.3566	0.3834	0.4012	0.4190 (22b)
	0.6034	0.5994	0.5954	0.5769	0.5735	0.5574	0.5574	0.5544	0.5636	0.5735	0.5805	0.5878 (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)			7.7600	1.3258	10.2879		(27)
Ground Floor Walls	64.5100	7.7600	56.7500	0.1800	10.2150		(29a)
Wall to Corridor	14.5400		14.5400	0.1800	2.6172		(29a)
Wall to Corridor	4.1500	2.1200	2.0300	0.1800	0.3654		(29a)
Total net area of external elements Aum(A, m ²)			83.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.6055		(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)							7.2516 (36)
Total fabric heat loss						(33) + (36) =	32.8571 (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	29.3811	29.1857	28.9941	28.0942	27.9258	27.1420	27.1420	26.9968	27.4439	27.9258	28.2664	28.6225 (38)
Heat transfer coeff	62.2382	62.0428	61.8512	60.9512	60.7829	59.9991	59.9991	59.8539	60.3010	60.7829	61.1235	61.4796 (39)
Average = Sum(39)m / 12 =												60.9504 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0038	1.0007	0.9976	0.9831	0.9804	0.9677	0.9677	0.9654	0.9726	0.9804	0.9859	0.9916 (40)
HLP (average)												0.9831 (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												2.0376 (42)
Average daily hot water use (litres/day)												82.5925 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.8518	87.5481	84.2444	80.9407	77.6370	74.3333	74.3333	77.6370	80.9407	84.2444	87.5481	90.8518 (44)
Energy conte	134.7306	117.8362	121.5964	106.0107	101.7198	87.7765	81.3378	93.3363	94.4510	110.0736	120.1539	130.4794 (45)
Energy content (annual)										Total = Sum(45)m =		1299.5023 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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	(59)
Heat gains from water heating, kWh/month	28.6302	25.0402	25.8392	22.5273	21.6155	18.6525	17.2843	19.8340	20.0708	23.3906	25.5327	(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	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	101.8790	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.4463	15.4957	12.6019	9.5405	7.1316	6.0208	6.5057	8.4564	11.3501	14.4116	16.8204	17.9312	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.9613	179.8080	175.1544	165.2475	152.7418	140.9882	133.1361	131.2894	135.9430	145.8499	158.3556	170.1092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	33.1879	(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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)
Water heating gains (Table 5)	38.4815	37.2622	34.7302	31.2879	29.0530	25.9062	23.2316	26.6586	27.8762	31.4390	35.4621	37.2673	(72)
Total internal gains	287.4529	286.1296	276.0502	259.6396	242.4902	226.4790	216.4371	219.9680	228.7330	245.2642	264.2018	278.8714	(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
Northeast					5.2400	11.2829	0.6300		0.7000	0.7700		18.0686
Southwest					2.5200	36.7938	0.6300		0.7000	0.7700		28.3366 (75)
Solar gains	46.4052	85.0469	132.3064	190.6545	237.9381	246.9454	233.6172	196.7014	152.2538	98.2932	56.6757	39.0060 (83)
Total gains	333.8581	371.1765	408.3567	450.2941	480.4282	473.4244	450.0543	416.6695	380.9867	343.5574	320.8775	317.8774 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	69.1786	69.3966	69.6116	70.6393	70.8350	71.7604	71.7604	71.9344	71.4011	70.8350	70.4403	70.0323		
alpha	5.6119	5.6264	5.6408	5.7093	5.7223	5.7840	5.7840	5.7956	5.7601	5.7223	5.6960	5.6688		
util living area	0.9988	0.9976	0.9935	0.9758	0.9110	0.7509	0.5752	0.6392	0.8869	0.9858	0.9976	0.9991	(86)	
MIT	19.9015	20.0212	20.2348	20.5343	20.8005	20.9554	20.9920	20.9859	20.8776	20.5413	20.1732	19.8844	(87)	
Th 2	20.0801	20.0828	20.0853	20.0975	20.0997	20.1103	20.1103	20.1123	20.1062	20.0997	20.0951	20.0903	(88)	
util rest of house	0.9985	0.9968	0.9912	0.9663	0.8759	0.6694	0.4649	0.5267	0.8297	0.9786	0.9966	0.9988	(89)	
MIT 2	19.0705	19.1921	19.4068	19.7110	19.9594	20.0888	20.1081	20.1080	20.0341	19.7227	19.3542	19.0618	(90)	
Living area fraction									fLA = Living area / (4) =			0.4702	(91)	
MIT	19.4612	19.5819	19.7961	20.0981	20.3549	20.4962	20.5237	20.5207	20.4307	20.1076	19.7392	19.4485	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.4612	19.5819	19.7961	20.0981	20.3549	20.4962	20.5237	20.5207	20.4307	20.1076	19.7392	19.4485	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9962	0.9902	0.9663	0.8870	0.7066	0.5171	0.5800	0.8529	0.9787	0.9961	0.9986	(94)
Useful gains	333.2241	369.7649	404.3554	435.1039	426.1312	334.5244	232.7385	241.6821	324.9510	336.2297	319.6160	317.4202	(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	943.6050	910.9055	822.3783	682.5352	526.0676	353.7693	235.4169	246.6421	381.7459	577.8975	772.5544	937.4731	(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	454.1234	363.6465	311.0090	178.1505	74.3527	0.0000	0.0000	0.0000	0.0000	179.8009	326.1156	461.3193	(98)
Space heating												2348.5180	(98)
Alpha heating per m2										(98) / (4) =		37.8793	(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	563.9912	443.9931	454.8898	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8954	0.9481	0.9274	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	505.0057	420.9459	421.8619	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	630.0406	601.2802	563.6792	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	90.0251	134.1687	105.5121	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												329.7059	(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	22.5063	33.5422	26.3780	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												82.4265 (107)
Energy for space heating												1.3295 (108)
Energy for space cooling												37.8793 (99)
Total												1.3295 (108)
Target Fabric Energy Efficiency (TFEE)												39.2088 (109)
												45.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.0000 (1b)	x 2.3800 (2b)	= 147.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.5600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.2400
Infiltration rate					0.2120 (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) =				0.1961 (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	0.2304	0.2157	0.2157	0.1961	0.2010	0.1912	0.1912	0.1863	0.1863	0.2010	0.1961	0.2010 (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)			7.7600	1.1450	8.8855		(27)
Ground Floor Walls	64.5100	7.7600	56.7500	0.2700	15.3225		(29a)
Wall to Corridor	14.5400		14.5400	0.2041	2.9673		(29a)
Wall to Corridor	4.1500	2.1200	2.0300	0.2320	0.4710		(29a)
Total net area of external elements Aum(A, m ²)					83.2000		(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	29.9783	(33)
Party Floor 1					61.5800		(32d)
Party Ceilings 1					53.8200		(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)							8.9887 (36)
Total fabric heat loss							(33) + (36) = 38.9670 (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	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474 (38)
Heat transfer coeff	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144 (39)
Average = Sum(39)m / 12 =												63.3144 (39)
HLP	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212 (40)
HLP (average)												1.0212 (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												2.0376 (42)
Average daily hot water use (litres/day)												82.5925 (43)
Daily hot water use	90.8518	87.5481	84.2444	80.9407	77.6370	74.3333	74.3333	77.6370	80.9407	84.2444	87.5481	90.8518 (44)
Energy conte	134.7306	117.8362	121.5964	106.0107	101.7198	87.7765	81.3378	93.3363	94.4510	110.0736	120.1539	130.4794 (45)
Energy content (annual)												Total = Sum(45)m = 1299.5023 (45)
Distribution loss (46)m = 0.15 x (45)m	20.2096	17.6754	18.2395	15.9016	15.2580	13.1665	12.2007	14.0004	14.1677	16.5110	18.0231	19.5719 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 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	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)
Combi loss	31.1827	28.1509	31.1447	30.1147	31.1001	30.0757	31.0650	31.0878	30.0970	31.1263	30.1516	31.1753	31.1753	(61)
Total heat required for water heating calculated for each month	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	161.6547	161.6547	(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	0.0000	(63)
Output from w/h	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	161.6547	161.6547	(64)
RHI water heating demand	52.5936	46.2183	48.2170	42.7772	41.5969	36.7046	34.8111	38.8063	38.9292	44.3810	47.4891	51.1782	51.1782	(65)
Heat gains from water heating, kWh/month														
	52.5936	46.2183	48.2170	42.7772	41.5969	36.7046	34.8111	38.8063	38.9292	44.3810	47.4891	51.1782	51.1782	(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	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	43.6159	38.7392	31.5049	23.8512	17.8291	15.0520	16.2643	21.1409	28.3753	36.0289	42.0511	44.8281	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.6139	268.3702	261.4245	246.6381	227.9728	210.4302	198.7106	195.9543	202.9000	217.6864	236.3516	253.8943	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	(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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)
Water heating gains (Table 5)	70.6903	68.7772	64.8078	59.4128	55.9098	50.9786	46.7891	52.1590	54.0683	59.6519	65.9570	68.7879	(72)
Total internal gains	472.9348	468.9013	450.7518	422.9168	394.7264	369.4755	354.7786	362.2689	378.3583	406.3819	437.3744	460.5250	(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	
Northeast				5.2400	14.6130	0.6300		0.7000		0.7700	23.4015 (75)	
Southwest				2.5200	45.0642	0.6300		0.7000		0.7700	34.7059 (79)	
Solar gains	58.1074	91.1311	145.3890	211.3610	248.4124	285.1239	259.2374	227.7722	175.5749	113.9768	70.8439	46.1690 (83)
Total gains	531.0422	560.0324	596.1409	634.2778	643.1387	654.5994	614.0160	590.0411	553.9332	520.3587	508.2183	506.6941 (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	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027
alpha	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335
util living area	0.9839	0.9772	0.9531	0.8803	0.7244	0.4882	0.3397	0.3428	0.6195	0.8786	0.9662	0.9866 (86)
MIT	20.2980	20.3757	20.5654	20.7956	20.9468	20.9949	20.9995	20.9994	20.9823	20.8351	20.5439	20.2728 (87)
Th 2	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657 (88)
util rest of house	0.9788	0.9701	0.9384	0.8447	0.6565	0.4013	0.2439	0.2430	0.5255	0.8334	0.9538	0.9822 (89)
MIT 2	19.4513	19.5270	19.7091	19.9181	20.0366	20.0641	20.0656	20.0656	20.0590	19.9561	19.6916	19.4268 (90)
Living area fraction												
MIT	19.8494	19.9260	20.1117	20.3306	20.4645	20.5017	20.5047	20.5047	20.4931	20.3693	20.0923	19.8246 (91)
Temperature adjustment												
adjusted MIT	19.8494	19.9260	20.1117	20.3306	20.4645	20.5017	20.5047	20.5047	20.4931	20.3693	20.0923	19.8246 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9774	0.9688	0.9392	0.8557	0.6867	0.4423	0.2890	0.2900	0.5696	0.8495	0.9542	0.9808	(94)
Ext temp.	519.0317	542.5522	559.8899	542.7507	441.6291	289.5118	177.4448	171.1156	315.5135	442.0629	484.9525	496.9869	(95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Month fracti	902.1926	881.7191	792.1712	647.7475	466.2806	291.3547	177.5766	171.2450	322.4660	523.5684	727.6284	894.2891	(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)
RHI space heating demand	285.0717	227.9201	172.8173	75.5976	18.3407	0.0000	0.0000	0.0000	0.0000	60.6401	174.7266	295.5928	(98)
												1310.7069	(98)
												1311	(98)

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	62.0000 (1b)	x 2.3800 (2b)	= 147.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.5600 (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					4.2400
Infiltration rate					0.2120 (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) =				0.1961 (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	0.2500	0.2451	0.2402	0.2157	0.2108	0.1863	0.1863	0.1814	0.1961	0.2108	0.2206	0.2304 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			7.7600	1.1450	8.8855		(27)
Ground Floor Walls	64.5100	7.7600	56.7500	0.2700	15.3225		(29a)
Wall to Corridor	14.5400		14.5400	0.2041	2.9673		(29a)
Wall to Corridor	4.1500	2.1200	2.0300	0.2320	0.4710		(29a)
Total net area of external elements Aum(A, m2)			83.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9783		(33)
Party Floor 1			61.5800				(32d)
Party Ceilings 1			53.8200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9887 (36)
Total fabric heat loss							(33) + (36) = 38.9670 (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	24.3487	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474 (38)
Heat transfer coeff	63.3158	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144 (39)
Average = Sum(39)m / 12 =												63.3146 (39)
HLP	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212 (40)
HLP (average)												1.0212 (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												2.0376 (42)
Average daily hot water use (litres/day)												82.5925 (43)
Daily hot water use	90.8518	87.5481	84.2444	80.9407	77.6370	74.3333	74.3333	77.6370	80.9407	84.2444	87.5481	90.8518 (44)
Energy conte	134.7306	117.8362	121.5964	106.0107	101.7198	87.7765	81.3378	93.3363	94.4510	110.0736	120.1539	130.4794 (45)
Energy content (annual)												Total = Sum(45)m = 1299.5023 (45)
Distribution loss (46)m = 0.15 x (45)m	20.2096	17.6754	18.2395	15.9016	15.2580	13.1665	12.2007	14.0004	14.1677	16.5110	18.0231	19.5719 (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	(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	(57)
Combi loss	31.1827	28.1509	31.1447	30.1147	31.1001	30.0757	31.0650	31.0878	30.0970	31.1263	30.1516	(61)
Total heat required for water heating calculated for each month	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	(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	(63)
Output from w/h	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	(64)
Heat gains from water heating, kWh/month	52.5936	46.2183	48.2170	42.7772	41.5969	36.7046	34.8111	38.8063	38.9292	44.3810	47.4891	(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	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	43.6159	38.7392	31.5049	23.8512	17.8291	15.0520	16.2643	21.1409	28.3753	36.0289	42.0511	44.8281	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.6139	268.3702	261.4245	246.6381	227.9728	210.4302	198.7106	195.9543	202.9000	217.6864	236.3516	253.8943	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	(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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)
Water heating gains (Table 5)	70.6903	68.7772	64.8078	59.4128	55.9098	50.9786	46.7891	52.1590	54.0683	59.6519	65.9570	68.7879	(72)
Total internal gains	472.9348	468.9013	450.7518	422.9168	394.7264	369.4755	354.7786	362.2689	378.3583	406.3819	437.3744	460.5250	(73)

6. Solar gains

[Jan]					Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
Northeast					5.2400	11.2829	0.6300	0.7000	0.7700	18.0686 (75)		
Southwest					2.5200	36.7938	0.6300	0.7000	0.7700	28.3366 (79)		
Solar gains	46.4052	85.0469	132.3064	190.6545	237.9381	246.9454	233.6172	196.7014	152.2538	98.2932	56.6757	39.0060 (83)
Total gains	519.3400	553.9482	583.0583	613.5713	632.6644	616.4209	588.3958	558.9703	530.6120	504.6752	494.0502	499.5310 (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	68.0013	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	
alpha	5.5334	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	
util living area	0.9899	0.9841	0.9688	0.9239	0.8150	0.6337	0.4695	0.5142	0.7544	0.9350	0.9816	0.9918	(86)
MIT	20.1573	20.2644	20.4521	20.6909	20.8864	20.9774	20.9963	20.9940	20.9432	20.7105	20.3871	20.1186	(87)
Th 2	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	(88)
util rest of house	0.9869	0.9793	0.9591	0.9001	0.7630	0.5511	0.3719	0.4133	0.6768	0.9096	0.9751	0.9894	(89)
MIT 2	19.3123	19.4177	19.6008	19.8258	19.9928	20.0558	20.0648	20.0641	20.0368	19.8481	19.5396	19.2741	(90)
Living area fraction	19.7096	19.8158	20.0011	20.2325	20.4130	20.4891	20.5028	20.5013	20.4630	20.2536	19.9381	19.6712	(92)
Temperature adjustment	19.7096	19.8158	20.0011	20.2325	20.4130	20.4891	20.5028	20.5013	20.4630	20.2536	19.9381	19.6712	(93)
adjusted MIT	19.7096	19.8158	20.0011	20.2325	20.4130	20.4891	20.5028	20.5013	20.4630	20.2536	19.9381	19.6712	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9855	0.9777	0.9583	0.9048	0.7835	0.5895	0.4179	0.4610	0.7115	0.9154	0.9741	0.9881	(94)
Ext temp.	511.8029	541.6063	558.7484	555.1780	495.7039	363.3875	245.9191	257.6604	377.5549	461.9763	481.2308	493.5633	(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	975.6718	944.3846	854.8132	717.5135	551.6567	372.8663	247.1017	259.6722	402.8686	611.2114	812.8359	979.5478	(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	345.1185	270.6671	220.2722	116.8815	41.6289	0.0000	0.0000	0.0000	0.0000	111.0309	238.7557	361.5725	(98)
Space heating per m ²												1705.9273	(98)
												27.5150	(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													1880.8459 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.1185	270.6671	220.2722	116.8815	41.6289	0.0000	0.0000	0.0000	0.0000	111.0309	238.7557	361.5725	(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)	380.5055	298.4201	242.8580	128.8661	45.8973	0.0000	0.0000	0.0000	0.0000	122.4156	263.2367	398.6467	(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	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	161.6547	(64)
Efficiency of water heater (217)m	89.4647	89.3683	89.1475	88.6711	87.8552	87.0000	87.0000	87.0000	87.0000	88.5908	89.2339	89.5237	(216)
Fuel for water heating, kWh/month	185.4510	163.3545	171.3353	153.5174	151.1804	135.4622	129.1986	143.0162	143.1586	159.3842	168.4399	180.5720	(219)
Water heating fuel used												1884.0704	(219)
Annual totals kWh/year													
Space heating fuel - main system												1880.8459	(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)												88.2114	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												163.2114	(231)
Electricity for lighting (calculated in Appendix L)												308.1080	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses												4236.2356	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1880.8459	3.4800	65.4534 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1884.0704	3.4800	65.5656 (247)
Mechanical ventilation fans	88.2114	13.1900	11.6351 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	308.1080	13.1900	40.6394 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			313.1861 (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] =	1.2293 (257)
SAP value		82.8509
SAP rating (Section 12)		83 (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	1880.8459	0.2160	406.2627 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1884.0704	0.2160	406.9592 (264)
Space and water heating			813.2219 (265)
Pumps and fans	163.2114	0.5190	84.7067 (267)
Energy for lighting	308.1080	0.5190	159.9080 (268)
Energy saving/generation technologies			
PV Unit	-713.8400	0.5190	-370.4830 (269)
Total kg/year			687.3537 (272)
CO2 emissions per m2			11.0900 (273)
EI value			91.3920
EI rating			91 (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 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	$3.48 / 0.8832 = 3.940$, stars = 4
Water heating environmental impact	$0.216 / 0.8832 = 0.2446$, 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	62.0000 (1b)	x 2.3800 (2b)	= 147.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 147.5600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.2400
Infiltration rate					0.2120 (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) =				0.1961 (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	0.2304	0.2157	0.2157	0.1961	0.2010	0.1912	0.1912	0.1863	0.1863	0.2010	0.1961	0.2010 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			7.7600	1.1450	8.8855		(27)
Ground Floor Walls	64.5100	7.7600	56.7500	0.2700	15.3225		(29a)
Wall to Corridor	14.5400		14.5400	0.2041	2.9673		(29a)
Wall to Corridor	4.1500	2.1200	2.0300	0.2320	0.4710		(29a)
Total net area of external elements Aum(A, m2)			83.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9783		(33)
Party Floor 1			61.5800				(32d)
Party Ceilings 1			53.8200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9887 (36)
Total fabric heat loss							(33) + (36) = 38.9670 (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	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474	24.3474 (38)
Heat transfer coeff	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144	63.3144 (39)
Average = Sum(39)m / 12 =												63.3144 (39)
HLP	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212	1.0212 (40)
HLP (average)												1.0212 (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												2.0376 (42)
Average daily hot water use (litres/day)												82.5925 (43)
Daily hot water use	90.8518	87.5481	84.2444	80.9407	77.6370	74.3333	74.3333	77.6370	80.9407	84.2444	87.5481	90.8518 (44)
Energy conte	134.7306	117.8362	121.5964	106.0107	101.7198	87.7765	81.3378	93.3363	94.4510	110.0736	120.1539	130.4794 (45)
Energy content (annual)												Total = Sum(45)m = 1299.5023 (45)
Distribution loss (46)m = 0.15 x (45)m	20.2096	17.6754	18.2395	15.9016	15.2580	13.1665	12.2007	14.0004	14.1677	16.5110	18.0231	19.5719 (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	31.1827	28.1509	31.1447	30.1147	31.1001	30.0757	31.0650	31.0878	30.0970	31.1263	30.1516	31.1753	(61)
Total heat required for water heating calculated for each month	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	161.6547	(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	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	161.6547	(64)
Heat gains from water heating, kWh/month	52.5936	46.2183	48.2170	42.7772	41.5969	36.7046	34.8111	38.8063	38.9292	44.3810	47.4891	51.1782	(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	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	122.2548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	43.6159	38.7392	31.5049	23.8512	17.8291	15.0520	16.2643	21.1409	28.3753	36.0289	42.0511	44.8281	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.6139	268.3702	261.4245	246.6381	227.9728	210.4302	198.7106	195.9543	202.9000	217.6864	236.3516	253.8943	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	49.2631	(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)	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	-81.5032	(71)
Water heating gains (Table 5)	70.6903	68.7772	64.8078	59.4128	55.9098	50.9786	46.7891	52.1590	54.0683	59.6519	65.9570	68.7879	(72)
Total internal gains	472.9348	468.9013	450.7518	422.9168	394.7264	369.4755	354.7786	362.2689	378.3583	406.3819	437.3744	460.5250	(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
Northeast				5.2400	14.6130	0.6300	0.7000			0.7700			23.4015 (75)
Southwest				2.5200	45.0642	0.6300	0.7000			0.7700			34.7059 (79)

Solar gains	58.1074	91.1311	145.3890	211.3610	248.4124	285.1239	259.2374	227.7722	175.5749	113.9768	70.8439	46.1690	(83)
Total gains	531.0422	560.0324	596.1409	634.2778	643.1387	654.5994	614.0160	590.0411	553.9332	520.3587	508.2183	506.6941	(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	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027	68.0027		
alpha	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335	5.5335		
util living area	0.9839	0.9772	0.9531	0.8803	0.7244	0.4882	0.3397	0.3428	0.6195	0.8786	0.9662	0.9866	(86)	
MIT	20.2980	20.3757	20.5654	20.7956	20.9468	20.9949	20.9995	20.9994	20.9823	20.8351	20.5439	20.2728	(87)	
Th 2	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	20.0657	(88)	
util rest of house	0.9788	0.9701	0.9384	0.8447	0.6565	0.4013	0.2439	0.2430	0.5255	0.8334	0.9538	0.9822	(89)	
MIT 2	19.4513	19.5270	19.7091	19.9181	20.0366	20.0641	20.0656	20.0656	20.0590	19.9561	19.6916	19.4268	(90)	
Living area fraction	19.8494	19.9260	20.1117	20.3306	20.4645	20.5017	20.5047	20.5047	20.4931	20.3693	20.0923	19.8246	(92)	
MIT	19.8494	19.9260	20.1117	20.3306	20.4645	20.5017	20.5047	20.5047	20.4931	20.3693	20.0923	19.8246	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.8494	19.9260	20.1117	20.3306	20.4645	20.5017	20.5047	20.5047	20.4931	20.3693	20.0923	19.8246	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9774	0.9688	0.9392	0.8557	0.6867	0.4423	0.2890	0.2900	0.5696	0.8495	0.9542	0.9808	(94)
Ext temp.	519.0317	542.5522	559.8899	542.7507	441.6291	289.5118	177.4448	171.1156	315.5135	442.0629	484.9525	496.9869	(95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Month fracti	902.1926	881.7191	792.1712	647.7475	466.2806	291.3547	177.5766	171.2450	322.4660	523.5684	727.6284	894.2891	(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	285.0717	227.9201	172.8173	75.5976	18.3407	0.0000	0.0000	0.0000	0.0000	60.6401	174.7266	295.5928	(98)
												1310.7069	(98)
												21.1404	(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													1445.1013 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	285.0717	227.9201	172.8173	75.5976	18.3407	0.0000	0.0000	0.0000	0.0000	60.6401	174.7266	295.5928	(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)	314.3018	251.2901	190.5373	83.3491	20.2212	0.0000	0.0000	0.0000	0.0000	66.8579	192.6423	325.9017	(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	165.9132	145.9872	152.7412	136.1255	132.8199	117.8521	112.4028	124.4241	124.5480	141.1999	150.3055	161.6547	(64)
Efficiency of water heater (217)m	89.3028	89.2185	88.9257	88.2860	87.4328	87.0000	87.0000	87.0000	87.0000	88.0795	88.9506	89.3565	(216)
Fuel for water heating, kWh/month	185.7873	163.6287	171.7627	154.1870	151.9110	135.4622	129.1986	143.0162	143.1586	160.3096	168.9763	180.9099	(219)
Water heating fuel used												1888.3081	(219)
Annual totals kWh/year													
Space heating fuel - main system												1445.1013	(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)													88.2114 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													163.2114 (231)
Electricity for lighting (calculated in Appendix L)													308.1080 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3804.7288 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1445.1013	3.6300	52.4572 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1888.3081	3.6300	68.5456 (247)
Mechanical ventilation fans	88.2114	19.4400	17.1483 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	308.1080	19.4400	59.8962 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	19.4400	0.0000 (252)
Total energy cost			307.6272 (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	1445.1013	0.2160	312.1419 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1888.3081	0.2160	407.8745 (264)
Space and water heating			720.0164 (265)
Pumps and fans	163.2114	0.5190	84.7067 (267)
Energy for lighting	308.1080	0.5190	159.9080 (268)
Energy saving/generation technologies			
PV Unit	-713.8400	0.5190	-370.4830 (269)
Total kg/year			594.1482 (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	1445.1013	1.2200	1763.0236 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1888.3081	1.2200	2303.7359 (264)
Space and water heating			4066.7595 (265)
Pumps and fans	163.2114	3.0700	501.0589 (267)
Energy for lighting	308.1080	3.0700	945.8914 (268)
Energy saving/generation technologies			
PV Unit	-713.8400	3.0700	-2191.4888 (269)
Primary energy kWh/year			3322.2210 (272)
Primary energy kWh/m2/year			53.5842 (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 83
Current environmental impact rating: B 91

(For testing purposes):	
A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures: (none) SAP change Cost change CO2 change

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

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 91

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	£92	£92	£0
Mains gas	£216	£216	£0
Space heating	£179	£179	£0
Water heating	£69	£69	£0
Lighting	£60	£60	£0
Total cost of fuels	£308	£308	£0
Total cost of uses	£308	£308	£0
Delivered energy	61 kWh/m²	61 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	54 kWh/m²	54 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 95	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	11 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	83 B	DER	13.38	TER	18.55
Environmental	91 B	% DER<TER	27.86		
CO ₂ Emissions (t/year)	0.59	DFEE	44.33	TFEE	45.09
General Requirements Compliance	Pass	% DFEE<TFEE	1.68		

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 95	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	11 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	83 B	DER	13.38	TER	18.55
Environmental	91 B	% DER<TER	27.86		
CO ₂ Emissions (t/year)	0.59	DFEE	44.33	TFEE	45.09
General Requirements Compliance	Pass	% DFEE<TFEE	1.68		

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 95	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	11 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	83 B	DER	13.38	TER	18.55
Environmental	91 B	% DER<TER	27.86		
CO ₂ Emissions (t/year)	0.59	DFEE	44.33	TFEE	45.09
General Requirements Compliance	Pass	% DFEE<TFEE	1.68		

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

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 95			Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)		
Property	11 Haines Crescent, WEST END, SO30 3LG				
SAP Rating	83 B	DER	13.38	TER	18.55
Environmental	91 B	% DER<TER	27.86		
CO ₂ Emissions (t/year)	0.59	DFEE	44.33	TFEE	45.09
General Requirements Compliance	Pass	% DFEE<TFEE	1.68		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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

Orientation		South West								
Property Tenure		Unknown								
Transaction Type		New dwelling								
Terrain Type		Suburban								
1.0 Property Type		Flat, 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		
				34.96 m		62.00 m²		2.38 m		
7.0 Living Area		29.15				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	64.51	56.75		
Wall to Corridor		Cavity Wall				0.25	14.54	14.54		
Wall to Corridor		Cavity Wall				0.25	4.15	2.03		
10.1 Party Ceilings										
Description		Construction						Area (m²)		
11.1 Party Floors										
Description		Construction						Area (m²)		
12.0 Opening Types										
Description		Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door		Manufacturer	Solid Door							1.10
Windows		Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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	[3] Wall to Corridor	South West							2.12	
South West Elevation	Window	[1] Ground Floor Walls	South West	None	0.00					2.52	
North East Elevation	Window	[1] Ground Floor Walls	North East	None	0.00					5.24	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	7.20	0.300	No
Table K1 - Approved	E3 Sill	6.29	0.040	No
Table K1 - Approved	E4 Jamb	16.50	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	69.92	0.070	No
Table K1 - Approved	E16 Corner (normal)	14.30	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	4.77	-0.090	No

Y-value 0.108 W/m²K

18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	5.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	Yes	
	4.24	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
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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

21.0 Fixed Cooling System	No
22.0 Lighting	
Internal	
Total number of light fittings	9
Total number of L.E.L. fittings	9
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
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Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

29.0 Hot Water Cylinder	None	
32.0 Photovoltaic Unit	More Dwellings, One Block	
Apportioned	713.84	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 %			