



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 14 Haines Crescent
WEST END, SO30 3LG

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

Report Issue Date: 02/08/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 96	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Property	14 Haines Crescent, WEST END, SO30 3LG		
SAP Rating	83 B	DER	13.75
Environmental	91 B	TER	18.87
CO ₂ Emissions (t/year)	0.62	% DER<TER	27.13
General Requirements Compliance	Pass	DfEE	46.27
		TfEE	47.46
		% DfEE<TfEE	2.49
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)	18.87	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.75	kgCO ₂ /m ²	Pass
	-5.12 (-27.1%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	47.46	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	46.27	kWh/m ² /yr	
	-1.2 (-2.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.27 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	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	4.23 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.35

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

4.01 m², No overhang

Windows facing North West

4.56 m², No overhang

Air change rate

3.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Door U-value

1.10

W/m²K

Photovoltaic array

723.05

kWh/Year

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.

THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 96	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Property	14 Haines Crescent, WEST END, SO30 3LG		
SAP Rating	83 B	DER	13.75
Environmental	91 B	TER	18.87
CO ₂ Emissions (t/year)	0.62	% DER<TER	27.13
General Requirements Compliance	Pass	DFEE	46.27
		TFEE	47.46
		% DFEE<TFEE	2.49
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	7.20	2.16	
External wall	E3 Sill	Table K1 - Approved	0.040	6.29	0.25	
External wall	E4 Jamb	Table K1 - Approved	0.050	17.10	0.86	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	71.70	5.02	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	9.54	0.86	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	4.77	-0.43	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	2.38	0.14	
External wall	E25 Staggered party wall between dwellings	Table K1 - Default	0.120	2.38	0.29	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	6.92	0.00	

Total: **9.14** W/mK:
Y-Value: **0.107** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 96			Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)		
Property	14 Haines Crescent, WEST END, SO30 3LG				
SAP Rating	83 B	DER	13.75	TER	18.87
Environmental	91 B	% DER<TER	27.13		
CO ₂ Emissions (t/year)	0.62	DFEE	46.27	TFEE	47.46
General Requirements Compliance	Pass	% DFEE<TFEE	2.49		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

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 63 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) 18.87 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.75 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)47.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	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:	4.23 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

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

Secondary heating system:

None

5 Cylinder insulation

Hot water storage	No cylinder
-------------------	-------------

6 Controls

Space heating controls:	Programmer, room thermostat and TRVs	OK
-------------------------	--------------------------------------	----

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

OK

8 Mechanical ventilation

Continuous extract system	
Specific fan power:	0.35
Maximum	0.7

OK

9 Summertime temperature

Overheating risk (Southern England):	Slight	OK
--------------------------------------	--------	----

Based on:

Overshading:	Average
Windows facing North East:	4.01 m ² , No overhang
Windows facing North West:	4.56 m ² , No overhang
Air change rate:	3.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.10 W/m ² K
Photovoltaic array	723.05 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	62.8000 (1b)	x 2.3800 (2b)	= 149.4640 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 149.4640 (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					4.2300
Infiltration rate					0.2115 (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) =				0.1956 (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	0.2494	0.2445	0.2397	0.2152	0.2103	0.1859	0.1859	0.1810	0.1956	0.2103	0.2201	0.2299 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.5700	1.1450	9.8130		(27)
Ground Floor Walls	66.0100	8.5700	57.4400	0.2700	15.5088		(29a)
Wall to Corridor	19.3100	2.1200	17.1900	0.2041	3.5082		(29a)
Total net area of external elements Aum(A, m ²)				85.3200			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.1619		(33)
Party Wall 1				8.2500	0.0000	0.0000	(32)
Party Floor 1				62.8600			(32d)
Party Ceilings 1				54.1800			(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)							9.1433 (36)
Total fabric heat loss							(33) + (36) = 40.3052 (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	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616 (38)
Average = Sum(39)m / 12 =	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345 (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)												2.0596 (42)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.4269	88.1023	84.7777	81.4530	78.1284	74.8038	74.8038	78.1284	81.4530	84.7777	88.1023	91.4269 (44)
Energy conte	135.5834	118.5821	122.3661	106.6818	102.3637	88.3321	81.8527	93.9271	95.0489	110.7703	120.9145	131.3053 (45)
Energy content (annual)												Total = Sum(45)m = 1307.7281 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3375	17.7873	18.3549	16.0023	15.3546	13.2498	12.2779	14.0891	14.2573	16.6156	18.1372	19.6958 (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	31.1856	28.1534	31.1472	30.1168	31.1020	30.0772	31.0664	31.0895	30.0988	31.1285	30.1541	31.1782	(61)
Total heat required for water heating calculated for each month	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	(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	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	(64)
Heat gains from water heating, kWh/month	52.8779	46.4669	48.4735	43.0009	41.8114	36.8897	34.9826	39.0031	39.1285	44.6133	47.7426	51.4536	(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	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.3072	15.3721	12.5015	9.4644	7.0748	5.9728	6.4538	8.3889	11.2596	14.2966	16.6863	17.7882	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	179.9493	181.8167	177.1111	167.0935	154.4481	142.5632	134.6234	132.7560	137.4616	147.4792	160.1246	172.0095	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	(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)	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	(71)
Water heating gains (Table 5)	71.0724	69.1472	65.1526	59.7235	56.1982	51.2357	47.0196	52.4236	54.3451	59.9641	66.3092	69.1580	(72)
Total internal gains	325.2229	323.2299	311.6591	293.1753	274.6149	256.6656	244.9907	250.4625	259.9602	278.6338	300.0140	315.8497	(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			4.0100			11.2829	0.6300			0.7000			0.7700			13.8273 (75)
Northwest			4.5600			11.2829	0.6300			0.7000			0.7700			15.7239 (81)
Solar gains	29.5512	60.1523	108.3753	177.9834	239.2446	255.0601	238.6035	190.2175	132.0570	73.5109	37.1830	24.1330 (83)				
Total gains	354.7741	383.3822	420.0344	471.1587	513.8595	511.7257	483.5942	440.6799	392.0172	352.1447	337.1970	339.9827 (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	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283		
alpha	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752		
util living area	0.9985	0.9974	0.9933	0.9748	0.9052	0.7464	0.5771	0.6498	0.8962	0.9863	0.9971	0.9988	(86)	
MIT	19.8838	19.9863	20.1983	20.5007	20.7876	20.9483	20.9896	20.9809	20.8519	20.4984	20.1341	19.8515	(87)	
Th 2	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	(88)	
util rest of house	0.9980	0.9965	0.9908	0.9647	0.8677	0.6611	0.4604	0.5302	0.8399	0.9791	0.9960	0.9984	(89)	
MIT 2	19.0320	19.1343	19.3452	19.6420	19.9067	20.0301	20.0519	20.0489	19.9667	19.6431	19.2820	18.9998	(90)	
Living area fraction	19.3783	19.4806	19.6920	19.9911	20.2648	20.4034	20.4331	20.4278	20.3266	19.9908	19.6284	19.3460	(91)	
MIT	19.3783	19.4806	19.6920	19.9911	20.2648	20.4034	20.4331	20.4278	20.3266	19.9908	19.6284	19.3460	(92)	
Temperature adjustment	19.3783	19.4806	19.6920	19.9911	20.2648	20.4034	20.4331	20.4278	20.3266	19.9908	19.6284	19.3460	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9975	0.9958	0.9896	0.9639	0.8771	0.6945	0.5083	0.5794	0.8585	0.9785	0.9953	0.9981	(94)
Ext temp.	353.9028	381.7651	415.6762	454.1417	450.7220	355.4013	245.7908	255.3316	336.5554	344.5831	335.6062	339.3207	(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	979.5873	947.2582	857.0443	720.5532	556.4268	377.0288	249.0254	261.6738	404.5199	610.0904	813.9330	983.9868	(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	465.5093	380.0113	328.3779	191.8163	78.6444	0.0000	0.0000	0.0000	0.0000	197.5375	344.3953	479.6316	(98)
												2465.9234	(98)
												39.2663	(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													2718.7689 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	465.5093	380.0113	328.3779	191.8163	78.6444	0.0000	0.0000	0.0000	0.0000	197.5375	344.3953	479.6316	(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)	513.2407	418.9761	362.0484	211.4843	86.7082	0.0000	0.0000	0.0000	0.0000	217.7921	379.7082	528.8110	(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	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	(64)
Efficiency of water heater (217)m	89.6939	89.6380	89.4876	89.1222	88.3361	87.0000	87.0000	87.0000	87.0000	89.1156	89.5389	87.0000	(216)
Fuel for water heating, kWh/month	185.9314	163.6979	171.5470	153.4956	151.0886	136.1027	129.7921	143.6973	143.8479	159.2301	168.7183	181.0718	(219)
Water heating fuel used												1888.2205	(219)
Annual totals kWh/year													
Space heating fuel - main system												2718.7689	(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)													89.3496 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													164.3496 (231)
Electricity for lighting (calculated in Appendix L)													305.6510 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													5076.9900 (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	2718.7689	0.2160	587.2541	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1888.2205	0.2160	407.8556	(264)
Space and water heating			995.1097	(265)
Pumps and fans	164.3496	0.5190	85.2974	(267)
Energy for lighting	305.6510	0.5190	158.6329	(268)
Energy saving/generation technologies				
PV Unit	-723.0500	0.5190	-375.2630	(269)
Total CO2, kg/year			863.7771	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.7500	(273)

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

DER			13.7500	ZC1
Total Floor Area		TFA	62.8000	
Assumed number of occupants		N	2.0596	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.9800	ZC2
CO2 emissions from cooking, equation (L16)			2.6820	ZC3
Total CO2 emissions			33.4120	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			33.4120	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.8000 (1b)	x 2.3800 (2b)	= 149.4640 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 149.4640 (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) = 0.1338 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3838 (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) = 0.3550 (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	0.4527	0.4438	0.4349	0.3905	0.3817	0.3373	0.3373	0.3284	0.3550	0.3817	0.3994	0.4172 (22b)
Effective ac	0.6024	0.5985	0.5946	0.5763	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5798	0.5870 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.1200	1.0000	2.1200			(26)					
TER Opening Type (Uw = 1.40)			8.5700	1.3258	11.3617			(27)					
Ground Floor Walls	66.0100	8.5700	57.4400	0.1800	10.3392			(29a)					
Wall to Corridor	19.3100	2.1200	17.1900	0.1800	3.0942			(29a)					
Total net area of external elements Aum(A, m2)			85.3200					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.9151			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								7.2634 (36)					
Total fabric heat loss						(33) + (36) =	34.1785	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 29.7147	Feb 29.5185	Mar 29.3261	Apr 28.4228	May 28.2537	Jun 27.4669	Jul 27.4669	Aug 27.3212	Sep 27.7700	Oct 28.2537	Nov 28.5957	Dec 28.9531	(38)
Heat transfer coeff	63.8932	63.6970	63.5047	62.6013	62.4323	61.6455	61.6455	61.4997	61.9485	62.4323	62.7742	63.1317	(39)
Average = Sum(39)m / 12 =												62.6005	(39)
HLP	Jan 1.0174	Feb 1.0143	Mar 1.0112	Apr 0.9968	May 0.9941	Jun 0.9816	Jul 0.9816	Aug 0.9793	Sep 0.9864	Oct 0.9941	Nov 0.9996	Dec 1.0053	(40)
HLP (average)												0.9968	(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												2.0596 (42)
Average daily hot water use (litres/day)												83.1153 (43)
Daily hot water use	91.4269	88.1023	84.7777	81.4530	78.1284	74.8038	74.8038	78.1284	81.4530	84.7777	88.1023	91.4269 (44)
Energy conte	135.5834	118.5821	122.3661	106.6818	102.3637	88.3321	81.8527	93.9271	95.0489	110.7703	120.9145	131.3053 (45)
Energy content (annual)										Total = Sum(45)m =		1307.7281 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3375	17.7873	18.3549	16.0023	15.3546	13.2498	12.2779	14.0891	14.2573	16.6156	18.1372	19.6958 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	46.5901	40.5512	43.2018	40.1686	39.8134	36.8896	38.1192	39.8134	40.1686	43.2018	43.4477	46.5901 (61)

Total heat required for water heating calculated for each month													
	182.1736	159.1333	165.5679	146.8504	142.1771	125.2216	119.9719	133.7405	135.2175	153.9721	164.3622	177.8954 (62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)	
Output from w/h								Solar input (sum of months) = Sum(63)m =					0.0000 (63)
	182.1736	159.1333	165.5679	146.8504	142.1771	125.2216	119.9719	133.7405	135.2175	153.9721	164.3622	177.8954 (64)	
	Total per year (kWh/year) = Sum(64)m =											1806.2836 (64)	
Heat gains from water heating, kWh/month													
	56.7290	49.5664	51.4872	45.5138	43.9893	38.5928	36.7458	41.1841	41.6459	47.6316	51.0660	55.3066 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.3072	15.3721	12.5015	9.4644	7.0748	5.9728	6.4538	8.3889	11.2596	14.2966	16.6863	17.7882 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	179.9493	181.8167	177.1111	167.0935	154.4481	142.5632	134.6234	132.7560	137.4616	147.4792	160.1246	172.0095 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980 (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)	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837 (71)
Water heating gains (Table 5)	76.2487	73.7595	69.2032	63.2137	59.1254	53.6011	49.3895	55.3550	57.8416	64.0209	70.9250	74.3368 (72)
Total internal gains	330.3992	327.8421	315.7097	296.6655	277.5421	259.0310	247.3606	253.3939	263.4567	282.6907	304.6298	321.0284 (73)

[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	4.0100	11.2829	0.6300	0.7000	0.7700	13.8273 (75)
Northwest	4.5600	11.2829	0.6300	0.7000	0.7700	15.7239 (81)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	68.2562	68.4665	68.6739	69.6649	69.8535	70.7451	70.7451	70.9127	70.3990	69.8535	69.4730	69.0796
alpha	5.5504	5.5644	5.5783	5.6443	5.6569	5.7163	5.7163	5.7275	5.6933	5.6569	5.6315	5.6053
util living area	0.9984	0.9972	0.9928	0.9721	0.8945	0.7201	0.5492	0.6193	0.8815	0.9846	0.9969	0.9988 (86)
MIT	19.9156	20.0208	20.2332	20.5445	20.8179	20.9625	20.9933	20.9874	20.8786	20.5404	20.1823	19.9004 (87)
Th 2	20.0689	20.0714	20.0740	20.0860	20.0882	20.0987	20.0987	20.1006	20.0946	20.0882	20.0837	20.0789 (88)
util rest of house	0.9979	0.9963	0.9902	0.9612	0.8554	0.6372	0.4414	0.5075	0.8225	0.9768	0.9956	0.9983 (89)
MIT 2	18.6136	18.7692	19.0806	19.5361	19.9041	20.0730	20.0961	20.0951	19.9907	19.5372	19.0146	18.8989 (90)
Living area fraction	19.1429	19.2780	19.5491	19.9461	20.2756	20.4346	19.2468	20.4578	20.3516	19.9450	19.4893	19.1280 (91)
MIT	19.1429	19.2780	19.5491	19.9461	20.2756	20.4346	19.2468	20.4578	20.3516	19.9450	19.4893	19.1280 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1429	19.2780	19.5491	19.9461	20.2756	20.4346	19.2468	20.4578	20.3516	19.9450	19.4893	19.1280 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9971	0.9951	0.9882	0.9592	0.8644	0.6696	0.4855	0.5532	0.8415	0.9752	0.9945	0.9977 (94)
Useful gains	358.9164	386.1083	419.0903	455.2603	446.7044	344.2543	235.9320	245.4214	332.8263	347.3604	339.9355	344.3756 (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	948.3605	915.8364	828.6817	691.4974	535.3938	359.6762	238.0010	249.5548	387.2803	583.4307	777.7278	942.4318 (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	438.5463	355.9773	304.7360	170.0907	65.9849	0.0000	0.0000	0.0000	0.0000	175.6364	315.2105	444.9538 (98)
Space heating												2271.1359 (98)
Space heating per m2											(98) / (4) =	36.1646 (99)

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
---	--------------

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													2431.6230 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	438.5463	355.9773	304.7360	170.0907	65.9849	0.0000	0.0000	0.0000	0.0000	175.6364	315.2105	444.9538	(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)	469.5357	381.1320	326.2698	182.1100	70.6477	0.0000	0.0000	0.0000	0.0000	188.0475	337.4844	476.3960	(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	182.1736	159.1333	165.5679	146.8504	142.1771	125.2216	119.9719	133.7405	135.2175	153.9721	164.3622	177.8954	(64)
Efficiency of water heater	87.1817	87.0187	86.5669	85.4218	83.2483	80.3000	80.3000	80.3000	80.3000	85.3833	86.6641	87.2651	(217)
Fuel for water heating, kWh/month	208.9584	182.8725	191.2602	171.9120	170.7868	155.9423	149.4046	166.5511	168.3905	180.3306	189.6542	203.8564	(219)
Water heating fuel used												2139.9195	(219)
Annual totals kWh/year													
Space heating fuel - main system												2431.6230	(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)												305.6510	(232)
Total delivered energy for all uses												4952.1935	(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	2431.6230	0.2160	525.2306 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2139.9195	0.2160	462.2226 (264)
Space and water heating			987.4532 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	305.6510	0.5190	158.6329 (268)
Total CO2, kg/m2/year			1185.0110 (272)
Emissions per m2 for space and water heating			15.7238 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5260 (272b)
Emissions per m2 for pumps and fans			0.6198 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7238 * 1.00) + 2.5260 + 0.6198, rounded to 2 d.p.			18.8700 (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	62.8000 (1b)	x 2.3800 (2b)	= 149.4640 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 149.4640 (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) = 0.1338 (8)
Measured/design AP50					Yes
Infiltration rate					4.2300
Number of sides sheltered					0.3453 (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) =				0.3194 (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	0.4073	0.3993	0.3913	0.3514	0.3434	0.3034	0.3034	0.2955	0.3194	0.3434	0.3593	0.3753 (22b)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5436	0.5510	0.5590	0.5646	0.5704 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.5700	1.1450	9.8130		(27)
Ground Floor Walls	66.0100	8.5700	57.4400	0.2700	15.5088		(29a)
Wall to Corridor	19.3100	2.1200	17.1900	0.2041	3.5082		(29a)
Total net area of external elements Aum(A, m ²)			85.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.1619		(33)
Party Wall 1			8.2500	0.0000	0.0000		(32)
Party Floor 1			62.8600				(32d)
Party Ceilings 1			54.1800				(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)							9.1433 (36)
Total fabric heat loss						(33) + (36) =	40.3052 (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	28.7518	28.5929	28.4373	27.7060	27.5692	26.9323	26.9323	26.8144	27.1776	27.5692	27.8460	28.1353 (38)
Heat transfer coeff	69.0570	68.8982	68.7425	68.0113	67.8745	67.2376	67.2376	67.1196	67.4829	67.8745	68.1512	68.4406 (39)
Average = Sum(39)m / 12 =												68.0106 (39)
HLP	1.0996	1.0971	1.0946	1.0830	1.0808	1.0707	1.0707	1.0688	1.0746	1.0808	1.0852	1.0898 (40)
HLP (average)												1.0830 (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												2.0596 (42)
Average daily hot water use (litres/day)												83.1153 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	91.4269	88.1023	84.7777	81.4530	78.1284	74.8038	74.8038	78.1284	81.4530	84.7777	88.1023	91.4269 (44)
Energy content (annual)	135.5834	118.5821	122.3661	106.6818	102.3637	88.3321	81.8527	93.9271	95.0489	110.7703	120.9145	131.3053 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1307.7281 (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	28.8115	25.1987	26.0028	22.6699	21.7523	18.7706	17.3937	19.9595	20.1979	23.5387	25.6943	(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	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.3072	15.3721	12.5015	9.4644	7.0748	5.9728	6.4538	8.3889	11.2596	14.2966	16.6863	17.7882	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	179.9493	181.8167	177.1111	167.0935	154.4481	142.5632	134.6234	132.7560	137.4616	147.4792	160.1246	172.0095	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	(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)	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	(71)
Water heating gains (Table 5)	38.7251	37.4981	34.9500	31.4859	29.2369	26.0702	23.3786	26.8273	28.0526	31.6380	35.6866	37.5032	(72)
Total internal gains	289.8756	288.5808	278.4565	261.9377	244.6537	228.5001	218.3497	221.8662	230.6677	247.3078	266.3914	281.1949	(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				4.0100	11.2829	0.6300	0.7000	0.7700	13.8273 (75)			
Northwest				4.5600	11.2829	0.6300	0.7000	0.7700	15.7239 (81)			
Solar gains	29.5512	60.1523	108.3753	177.9834	239.2446	255.0601	238.6035	190.2175	132.0570	73.5109	37.1830	24.1330 (83)
Total gains	319.4268	348.7331	386.8318	439.9212	483.8983	483.5602	456.9532	412.0836	362.7248	320.8187	303.5744	305.3278 (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	63.1523	63.2979	63.4413	64.1234	64.2526	64.8612	64.8612	64.9752	64.6254	64.2526	63.9917	63.7211	
alpha	5.2102	5.2199	5.2294	5.2749	5.2835	5.3241	5.3241	5.3317	5.3084	5.2835	5.2661	5.2481	
util living area	0.9991	0.9984	0.9957	0.9826	0.9294	0.7890	0.6233	0.7012	0.9260	0.9915	0.9983	0.9993	(86)
MIT	19.7411	19.8507	20.0760	20.4085	20.7251	20.9260	20.9833	20.9700	20.8033	20.4126	20.0250	19.7228	(87)
Th 2	20.0011	20.0032	20.0052	20.0148	20.0165	20.0249	20.0249	20.0264	20.0217	20.0165	20.0129	20.0092	(88)
util rest of house	0.9988	0.9978	0.9940	0.9751	0.8980	0.7047	0.4974	0.5755	0.8793	0.9868	0.9976	0.9991	(89)
MIT 2	18.8461	18.9573	19.1836	19.5198	19.8197	19.9884	20.0203	20.0169	19.8993	19.5280	19.1394	18.8344	(90)
Living area fraction										fLA = Living area / (4) =		0.4065	(91)
MIT	19.2100	19.3205	19.5464	19.8811	20.1878	20.3696	20.4118	20.4044	20.2668	19.8876	19.4995	19.1955	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2100	19.3205	19.5464	19.8811	20.1878	20.3696	20.4118	20.4044	20.2668	19.8876	19.4995	19.1955	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9984	0.9972	0.9930	0.9739	0.9043	0.7369	0.5492	0.6273	0.8932	0.9860	0.9971	0.9988	(94)
Useful gains	318.9313	347.7738	384.1094	428.4209	437.6094	356.3593	250.9782	258.5119	323.9901	316.3130	302.6867	304.9576	(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	1029.6368	993.5474	896.8410	746.8361	576.1042	387.9314	256.2948	268.7717	416.1529	630.3925	845.0389	1026.3034	(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	528.7649	433.9598	381.4723	229.2589	103.0401	0.0000	0.0000	0.0000	0.0000	233.6752	390.4936	536.6813	(98)
Space heating												2837.3462	(98)
Space heating per m2										(98) / (4) =		45.1807	(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	632.0332	497.5580	510.1092	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8487	0.9140	0.8779	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	536.4158	454.7479	447.8019	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	642.5143	609.9398	558.8841	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	76.3909	115.4628	82.6452	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												274.4989	(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	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	19.0977	28.8657	20.6613	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												68.6247 (107)
Space cooling per m2												1.0928 (108)
Energy for space heating												45.1807 (99)
Energy for space cooling												1.0928 (108)
Total												46.2734 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.3 (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	62.8000 (1b)	x 2.3800 (2b)	= 149.4640 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 149.4640 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1338 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3838 (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) =				0.3550 (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	0.4527	0.4438	0.4349	0.3905	0.3817	0.3373	0.3373	0.3284	0.3550	0.3817	0.3994	0.4172 (22b)
Effective ac	0.6024	0.5985	0.5946	0.5763	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5798	0.5870 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200			(26)				
TER Opening Type (Uw = 1.40)			8.5700	1.3258	11.3617			(27)				
Ground Floor Walls	66.0100	8.5700	57.4400	0.1800	10.3392			(29a)				
Wall to Corridor	19.3100	2.1200	17.1900	0.1800	3.0942			(29a)				
Total net area of external elements Aum(A, m2)			85.3200					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	26.9151		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								7.2634 (36)				
Total fabric heat loss						(33) + (36) =		34.1785 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	29.7147	29.5185	29.3261	28.4228	28.2537	27.4669	27.4669	27.3212	27.7700	28.2537	28.5957	28.9531 (38)
Heat transfer coeff	63.8932	63.6970	63.5047	62.6013	62.4323	61.6455	61.6455	61.4997	61.9485	62.4323	62.7742	63.1317 (39)
Average = Sum(39)m / 12 =												62.6005 (39)
HLP	1.0174	1.0143	1.0112	0.9968	0.9941	0.9816	0.9816	0.9793	0.9864	0.9941	0.9996	1.0053 (40)
HLP (average)												0.9968 (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												2.0596 (42)
Average daily hot water use (litres/day)												83.1153 (43)
Daily hot water use	91.4269	88.1023	84.7777	81.4530	78.1284	74.8038	74.8038	78.1284	81.4530	84.7777	88.1023	91.4269 (44)
Energy conte	135.5834	118.5821	122.3661	106.6818	102.3637	88.3321	81.8527	93.9271	95.0489	110.7703	120.9145	131.3053 (45)
Energy content (annual)										Total = Sum(45)m =		1307.7281 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
28.8115 25.1987 26.0028 22.6699 21.7523 18.7706 17.3937 19.9595 20.1979 23.5387 25.6943 27.9024 (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	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	102.9797	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.3072	15.3721	12.5015	9.4644	7.0748	5.9728	6.4538	8.3889	11.2596	14.2966	16.6863	17.7882	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	179.9493	181.8167	177.1111	167.0935	154.4481	142.5632	134.6234	132.7560	137.4616	147.4792	160.1246	172.0095	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	33.2980	(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)	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	(71)
Water heating gains (Table 5)	38.7251	37.4981	34.9500	31.4859	29.2369	26.0702	23.3786	26.8273	28.0526	31.6380	35.6866	37.5032	(72)
Total internal gains	289.8756	288.5808	278.4565	261.9377	244.6537	228.5001	218.3497	221.8662	230.6677	247.3078	266.3914	281.1949	(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				4.0100	11.2829	0.6300	0.7000	0.7700	13.8273 (75)			
Northwest				4.5600	11.2829	0.6300	0.7000	0.7700	15.7239 (81)			
Solar gains	29.5512	60.1523	108.3753	177.9834	239.2446	255.0601	238.6035	190.2175	132.0570	73.5109	37.1830	24.1330 (83)
Total gains	319.4268	348.7331	386.8318	439.9212	483.8983	483.5602	456.9532	412.0836	362.7248	320.8187	303.5744	305.3278 (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, nilm (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.2562	68.4665	68.6739	69.6649	69.8535	70.7451	70.7451	70.9127	70.3990	69.8535	69.4730	69.0796	
alpha	5.5504	5.5644	5.5783	5.6443	5.6569	5.7163	5.7163	5.7275	5.6933	5.6569	5.6315	5.6053	
util living area	0.9991	0.9984	0.9954	0.9799	0.9154	0.7529	0.5810	0.6594	0.9108	0.9905	0.9983	0.9993	(86)
MIT	19.8539	19.9614	20.1780	20.4979	20.7881	20.9530	20.9911	20.9828	20.8504	20.4897	20.1243	19.8396	(87)
Th 2	20.0689	20.0714	20.0740	20.0860	20.0882	20.0987	20.0987	20.1006	20.0946	20.0882	20.0837	20.0789	(88)
util rest of house	0.9988	0.9978	0.9937	0.9717	0.8812	0.6707	0.4686	0.5439	0.8604	0.9855	0.9976	0.9991	(89)
MIT 2	19.0138	19.1232	19.3412	19.6664	19.9385	20.0761	20.0963	20.0953	20.0033	19.6631	19.2961	19.0077	(90)
Living area fraction										fLA = Living area / (4) =		0.4065	(91)
MIT	19.3553	19.4639	19.6814	20.0044	20.2839	20.4326	20.4600	20.4561	20.3477	19.9991	19.6328	19.3459	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3553	19.4639	19.6814	20.0044	20.2839	20.4326	20.4600	20.4561	20.3477	19.9991	19.6328	19.3459	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9985	0.9973	0.9927	0.9709	0.8895	0.7030	0.5147	0.5914	0.8767	0.9848	0.9971	0.9989	(94)
Useful gains	318.9568	347.7910	384.0079	427.0988	430.4503	339.9200	235.1831	243.6968	318.0135	315.9541	302.6988	304.9819	(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	961.9328	927.6785	837.0784	695.1498	535.9124	359.5516	237.9541	249.4467	387.0334	586.8098	786.7371	956.1869	(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	478.3741	389.6844	337.0844	192.9967	78.4638	0.0000	0.0000	0.0000	0.0000	201.5167	348.5075	484.4965	(98)
Space heating												2511.1242	(98)
Space heating per m2												39.9861	(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	579.4673	456.1764	467.3981	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8913	0.9442	0.9160	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	516.4852	430.6998	428.1136	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	642.5143	609.9398	558.8841	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	90.7410	133.3545	97.2932	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												321.3888	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

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	22.6852	33.3386	24.3233	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												80.3472 (107)
Space cooling per m2												1.2794 (108)
Energy for space heating												39.9861 (99)
Energy for space cooling												1.2794 (108)
Total												41.2655 (109)
Target Fabric Energy Efficiency (TFEE)												47.5 (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	62.8000 (1b)	x 2.3800 (2b)	= 149.4640 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 149.4640 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
									Air changes per hour			
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							4.2300					
Infiltration rate							0.2115	(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) =	0.1956	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000
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
Adj infilt rate												
	0.2299	0.2152	0.2152	0.1956	0.2005	0.1907	0.1907	0.1859	0.1859	0.2005	0.1956	0.2005
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000
												(23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000
												(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.5700	1.1450	9.8130		(27)
Ground Floor Walls	66.0100	8.5700	57.4400	0.2700	15.5088		(29a)
Wall to Corridor	19.3100	2.1200	17.1900	0.2041	3.5082		(29a)
Total net area of external elements Aum(A, m ²)			85.3200				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				31.1619		(33)
Party Wall 1			8.2500	0.0000	0.0000		(32)
Party Floor 1			62.8600				(32d)
Party Ceilings 1			54.1800				(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)							9.1433 (36)
Total fabric heat loss	(33) + (36) =						40.3052 (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	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616 (38)
Heat transfer coeff	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668 (39)
Average = Sum(39)m / 12 =												64.9668 (39)
HLP	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345 (40)
HLP (average)												1.0345 (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												2.0596 (42)
Average daily hot water use (litres/day)												83.1153 (43)
Daily hot water use	91.4269	88.1023	84.7777	81.4530	78.1284	74.8038	74.8038	78.1284	81.4530	84.7777	88.1023	91.4269 (44)
Energy conte	135.5834	118.5821	122.3661	106.6818	102.3637	88.3321	81.8527	93.9271	95.0489	110.7703	120.9145	131.3053 (45)
Energy content (annual)	Total = Sum(45)m =											1307.7281 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3375	17.7873	18.3549	16.0023	15.3546	13.2498	12.2779	14.0891	14.2573	16.6156	18.1372	19.6958 (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	31.1856	28.1534	31.1472	30.1168	31.1020	30.0772	31.0664	31.0895	30.0988	31.1285	30.1541	31.1782	31.1782	(61)
Total heat required for water heating calculated for each month	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	162.4835	(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	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	162.4835	(64)
RHI water heating demand	52.8779	46.4669	48.4735	43.0009	41.8114	36.8897	34.9826	39.0031	39.1285	44.6133	47.7426	51.4536	51.4536	(65)
Heat gains from water heating, kWh/month														
	52.8779	46.4669	48.4735	43.0009	41.8114	36.8897	34.9826	39.0031	39.1285	44.6133	47.7426	51.4536	51.4536	(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	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	43.2681	38.4303	31.2536	23.6610	17.6869	14.9320	16.1346	20.9723	28.1490	35.7416	41.7157	44.4706	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.5811	271.3681	264.3449	249.3933	230.5195	212.7809	200.9304	198.1434	205.1666	220.1182	238.9919	256.7306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	(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)	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	(71)
Water heating gains (Table 5)	71.0724	69.1472	65.1526	59.7235	56.1982	51.2357	47.0196	52.4236	54.3451	59.9641	66.3092	69.1580	(72)
Total internal gains	476.5306	472.5547	454.3602	426.3868	398.0136	372.5577	357.6936	365.1483	381.2697	409.4329	440.6259	463.9683	(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				4.0100	14.6130	0.6300	0.7000	0.7700	17.9084 (75)			
Northwest				4.5600	14.6130	0.6300	0.7000	0.7700	20.3647 (81)			
Solar gains	38.2731	66.7797	122.9967	202.1121	254.0262	298.5691	268.7966	224.9107	156.8134	88.2740	48.1126	29.5138 (83)
Total gains	514.8037	539.3344	577.3569	628.4989	652.0399	671.1267	626.4902	590.0590	538.0831	497.7069	488.7385	493.4821 (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	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283
alpha	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752
util living area	0.9871	0.9821	0.9618	0.8913	0.7298	0.4884	0.3416	0.3516	0.6482	0.9014	0.9735	0.9890 (86)
MIT	20.2479	20.3205	20.5184	20.7739	20.9429	20.9946	20.9994	20.9993	20.9771	20.8020	20.4962	20.2271 (87)
Th 2	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547 (88)
util rest of house	0.9828	0.9763	0.9491	0.8574	0.6615	0.4005	0.2441	0.2482	0.5512	0.8610	0.9632	0.9853 (89)
MIT 2	19.3931	19.4642	19.6558	19.8899	20.0233	20.0530	20.0546	20.0546	20.0458	19.9199	19.6370	19.3728 (90)
Living area fraction												
MIT	19.7406	19.8123	20.0064	20.2493	20.3971	20.4358	20.4387	20.4387	20.4244	20.2785	19.9863	19.7201 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7406	19.8123	20.0064	20.2493	20.3971	20.4358	20.4387	20.4387	20.4244	20.2785	19.9863	19.7201 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	505.0775	525.5749	547.5618	543.7090	448.1935	292.8415	177.7942	171.2850	317.7609	433.9048	470.3364	485.4417	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	918.6676	897.3415	806.0068	659.3673	474.0720	294.6745	177.9237	171.4249	326.4199	531.3305	739.7310	910.8432	(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	307.7111	249.8271	192.2831	83.2739	19.2536	0.0000	0.0000	0.0000	0.0000	72.4847	193.9641	316.4987	(98)
Space heating													
RHI space heating demand													

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	62.8000 (1b)	x 2.3800 (2b)	= 149.4640 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 149.4640 (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					4.2300
Infiltration rate					0.2115 (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) =				0.1956 (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	0.2494	0.2445	0.2397	0.2152	0.2103	0.1859	0.1859	0.1810	0.1956	0.2103	0.2201	0.2299 (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)			8.5700	1.1450	9.8130		(27)
Ground Floor Walls	66.0100	8.5700	57.4400	0.2700	15.5088		(29a)
Wall to Corridor	19.3100	2.1200	17.1900	0.2041	3.5082		(29a)
Total net area of external elements Aum(A, m2)			85.3200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.1619		(33)
Party Wall 1			8.2500	0.0000	0.0000		(32)
Party Floor 1			62.8600				(32d)
Party Ceilings 1			54.1800				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1433 (36)
Total fabric heat loss						(33) + (36) =	40.3052 (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	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616 (38)
Heat transfer coeff	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668 (39)
Average = Sum(39)m / 12 =												64.9668 (39)
HLP	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345 (40)
HLP (average)												1.0345 (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												2.0596 (42)
Average daily hot water use (litres/day)												83.1153 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.4269	88.1023	84.7777	81.4530	78.1284	74.8038	74.8038	78.1284	81.4530	84.7777	88.1023	91.4269 (44)
Energy conte	135.5834	118.5821	122.3661	106.6818	102.3637	88.3321	81.8527	93.9271	95.0489	110.7703	120.9145	131.3053 (45)
Energy content (annual)	Total = Sum(45)m =											1307.7281 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3375	17.7873	18.3549	16.0023	15.3546	13.2498	12.2779	14.0891	14.2573	16.6156	18.1372	19.6958 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	31.1856	28.1534	31.1472	30.1168	31.1020	30.0772	31.0664	31.0895	30.0988	31.1285	30.1541	31.1782	(61)
Total heat required for water heating calculated for each month	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	(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	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	(64)
Heat gains from water heating, kWh/month	52.8779	46.4669	48.4735	43.0009	41.8114	36.8897	34.9826	39.0031	39.1285	44.6133	47.7426	51.4536	(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	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	43.2681	38.4303	31.2536	23.6610	17.6869	14.9320	16.1346	20.9723	28.1490	35.7416	41.7157	44.4706	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.5811	271.3681	264.3449	249.3933	230.5195	212.7809	200.9304	198.1434	205.1666	220.1182	238.9919	256.7306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	(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)	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	(71)
Water heating gains (Table 5)	71.0724	69.1472	65.1526	59.7235	56.1982	51.2357	47.0196	52.4236	54.3451	59.9641	66.3092	69.1580	(72)
Total internal gains	476.5306	472.5547	454.3602	426.3868	398.0136	372.5577	357.6936	365.1483	381.2697	409.4329	440.6259	463.9683	(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					4.0100	11.2829	0.6300	0.7000			0.7700	13.8273	(75)
Northwest					4.5600	11.2829	0.6300	0.7000			0.7700	15.7239	(81)
Solar gains	29.5512	60.1523	108.3753	177.9834	239.2446	255.0601	238.6035	190.2175	132.0570	73.5109	37.1830	24.1330	(83)
Total gains	506.0818	532.7070	562.7355	604.3702	637.2582	627.6178	596.2971	555.3657	513.3267	482.9438	477.8089	488.1012	(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	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283		
alpha	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752		
util living area	0.9917	0.9876	0.9751	0.9330	0.8222	0.6373	0.4749	0.5296	0.7831	0.9488	0.9853	0.9932	(86)	
MIT	20.1093	20.2059	20.3992	20.6605	20.8774	20.9758	20.9959	20.9928	20.9293	20.6678	20.3397	20.0733	(87)	
Th 2	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	(88)	
util rest of house	0.9892	0.9838	0.9671	0.9111	0.7706	0.5536	0.3753	0.4252	0.7066	0.9274	0.9800	0.9911	(89)	
MIT 2	19.2559	19.3513	19.5408	19.7888	19.9757	20.0441	20.0537	20.0527	20.0178	19.8006	19.4843	19.2202	(90)	
Living area fraction	19.6028	19.6987	19.8898	20.1432	20.3422	20.4229	20.4367	20.4349	20.3884	20.1531	19.8321	19.5670	(92)	
Temperature adjustment	19.6028	19.6987	19.8898	20.1432	20.3422	20.4229	20.4367	20.4349	20.3884	20.1531	19.8321	19.5670	(93)	
adjusted MIT	19.6028	19.6987	19.8898	20.1432	20.3422	20.4229	20.4367	20.4349	20.3884	20.1531	19.8321	19.5670	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	499.8414	523.1273	543.2737	552.0640	501.7979	368.5266	248.0314	259.8452	377.5901	449.1522	467.5146	483.0927	(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	994.1756	961.4233	869.8914	730.4346	561.4593	378.2938	249.2589	262.1323	408.5344	620.6368	827.1611	998.3446	(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	367.7846	294.5349	243.0036	128.4268	44.3881	0.0000	0.0000	0.0000	0.0000	127.5845	258.9455	383.3474	(98)
Space heating												1848.0154	(98)
Space heating per m2												29.4270	(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													2037.5032 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	367.7846	294.5349	243.0036	128.4268	44.3881	0.0000	0.0000	0.0000	0.0000	127.5845	258.9455	383.3474	(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)	405.4957	324.7353	267.9201	141.5952	48.9394	0.0000	0.0000	0.0000	0.0000	140.6665	285.4967	422.6543	(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	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	(64)
Efficiency of water heater (217)m	89.5123	89.4352	89.2308	88.7531	87.8949	87.0000	87.0000	87.0000	87.0000	88.7134	89.3007	87.0000	(216)
Fuel for water heating, kWh/month	186.3084	164.0691	172.0407	154.1338	151.8470	136.1027	129.7921	143.6973	143.8479	159.9521	169.1684	181.4118	(219)
Water heating fuel used												1892.3714	(219)
Annual totals kWh/year													
Space heating fuel - main system												2037.5032	(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)													89.3496 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													164.3496 (231)
Electricity for lighting (calculated in Appendix L)													305.6510 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4399.8752 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2037.5032	3.4800	70.9051 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1892.3714	3.4800	65.8545 (247)
Mechanical ventilation fans	89.3496	13.1900	11.7852 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	305.6510	13.1900	40.3154 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			318.7527 (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] =	1.2419 (257)
SAP value		82.6756
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	2037.5032	0.2160	440.1007 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1892.3714	0.2160	408.7522 (264)
Space and water heating			848.8529 (265)
Pumps and fans	164.3496	0.5190	85.2974 (267)
Energy for lighting	305.6510	0.5190	158.6329 (268)
Energy saving/generation technologies			
PV Unit	-723.0500	0.5190	-375.2630 (269)
Total kg/year			717.5203 (272)
CO2 emissions per m2			11.4300 (273)
EI value			91.0809
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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8837 = 3.938$, stars = 4
Water heating environmental impact	$0.216 / 0.8837 = 0.2444$, 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	62.8000 (1b)	x 2.3800 (2b)	= 149.4640 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 149.4640 (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					4.2300
Infiltration rate					0.2115 (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) =				0.1956 (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	0.2299	0.2152	0.2152	0.1956	0.2005	0.1907	0.1907	0.1859	0.1859	0.2005	0.1956	0.2005 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.5700	1.1450	9.8130		(27)
Ground Floor Walls	66.0100	8.5700	57.4400	0.2700	15.5088		(29a)
Wall to Corridor	19.3100	2.1200	17.1900	0.2041	3.5082		(29a)
Total net area of external elements Aum(A, m ²)				85.3200			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.1619		(33)
Party Wall 1				8.2500	0.0000	0.0000	(32)
Party Floor 1				62.8600			(32d)
Party Ceilings 1				54.1800			(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)							9.1433 (36)
Total fabric heat loss							(33) + (36) = 40.3052 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616	24.6616 (38)
Heat transfer coeff	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668	64.9668 (39)
Average = Sum(39)m / 12 =												64.9668 (39)
HLP	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345	1.0345 (40)
HLP (average)												1.0345 (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												2.0596 (42)
Average daily hot water use (litres/day)												83.1153 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.4269	88.1023	84.7777	81.4530	78.1284	74.8038	74.8038	78.1284	81.4530	84.7777	88.1023	91.4269 (44)
Energy conte	135.5834	118.5821	122.3661	106.6818	102.3637	88.3321	81.8527	93.9271	95.0489	110.7703	120.9145	131.3053 (45)
Energy content (annual)												Total = Sum(45)m = 1307.7281 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3375	17.7873	18.3549	16.0023	15.3546	13.2498	12.2779	14.0891	14.2573	16.6156	18.1372	19.6958 (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	31.1856	28.1534	31.1472	30.1168	31.1020	30.0772	31.0664	31.0895	30.0988	31.1285	30.1541	31.1782	(61)
Total heat required for water heating calculated for each month	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	(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	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	(64)
Heat gains from water heating, kWh/month	52.8779	46.4669	48.4735	43.0009	41.8114	36.8897	34.9826	39.0031	39.1285	44.6133	47.7426	51.4536	(65)
Solar input (sum of months) = Sum (63)m =													0.0000 (63)
Total per year (kWh/year) = Sum (64)m =													1674.2260 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	123.5756	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	43.2681	38.4303	31.2536	23.6610	17.6869	14.9320	16.1346	20.9723	28.1490	35.7416	41.7157	44.4706	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.5811	271.3681	264.3449	249.3933	230.5195	212.7809	200.9304	198.1434	205.1666	220.1182	238.9919	256.7306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	49.4172	(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)	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	-82.3837	(71)
Water heating gains (Table 5)	71.0724	69.1472	65.1526	59.7235	56.1982	51.2357	47.0196	52.4236	54.3451	59.9641	66.3092	69.1580	(72)
Total internal gains	476.5306	472.5547	454.3602	426.3868	398.0136	372.5577	357.6936	365.1483	381.2697	409.4329	440.6259	463.9683	(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					4.0100	14.6130	0.6300	0.7000			0.7700	17.9084
Northwest					4.5600	14.6130	0.6300	0.7000			0.7700	20.3647 (75)
Solar gains	38.2731	66.7797	122.9967	202.1121	254.0262	298.5691	268.7966	224.9107	156.8134	88.2740	48.1126	29.5138 (83)
Total gains	514.8037	539.3344	577.3569	628.4989	652.0399	671.1267	626.4902	590.0590	538.0831	497.7069	488.7385	493.4821 (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	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	67.1283	
alpha	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	5.4752	
util living area	0.9871	0.9821	0.9618	0.8913	0.7298	0.4884	0.3416	0.3516	0.6482	0.9014	0.9735	0.9890	(86)
MIT	20.2479	20.3205	20.5184	20.7739	20.9429	20.9946	20.9994	20.9993	20.9771	20.8020	20.4962	20.2271	(87)
Th 2	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	20.0547	(88)
util rest of house	0.9828	0.9763	0.9491	0.8574	0.6615	0.4005	0.2441	0.2482	0.5512	0.8610	0.9632	0.9853	(89)
MIT 2	19.3931	19.4642	19.6558	19.8899	20.0233	20.0530	20.0546	20.0546	20.0458	19.9199	19.6370	19.3728	(90)
Living area fraction	19.7406	19.8123	20.0064	20.2493	20.3971	20.4358	20.4387	20.4387	20.4244	20.2785	19.9863	19.7201	(92)
Temperature adjustment	19.7406	19.8123	20.0064	20.2493	20.3971	20.4358	20.4387	20.4387	20.4244	20.2785	19.9863	19.7201	(93)
adjusted MIT	19.7406	19.8123	20.0064	20.2493	20.3971	20.4358	20.4387	20.4387	20.4244	20.2785	19.9863	19.7201	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	505.0775	525.5749	547.5618	543.7090	448.1935	292.8415	177.7942	171.2850	317.7609	433.9048	470.3364	485.4417	(95)
Ext temp.	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000	(96)
Heat loss rate W	918.6676	897.3415	806.0068	659.3673	474.0720	294.6745	177.9237	171.4249	326.4199	531.3305	739.7310	910.8432	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	307.7111	249.8271	192.2831	83.2739	19.2536	0.0000	0.0000	0.0000	0.0000	72.4847	193.9641	316.4987	(98)
Space heating												1435.2963	(98)
Space heating per m ²												22.8550	(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													1582.4656 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	307.7111	249.8271	192.2831	83.2739	19.2536	0.0000	0.0000	0.0000	0.0000	72.4847	193.9641	316.4987	(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)	339.2625	275.4434	211.9990	91.8125	21.2278	0.0000	0.0000	0.0000	0.0000	79.9170	213.8523	348.9512	(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	166.7690	146.7356	153.5133	136.7986	133.4657	118.4093	112.9191	125.0166	125.1477	141.8989	151.0686	162.4835	(64)
Efficiency of water heater (217)m	89.3642	89.2948	89.0193	88.3640	87.4497	87.0000	87.0000	87.0000	87.0000	88.2167	89.0420	89.4101	(216)
Fuel for water heating, kWh/month	186.6173	164.3271	172.4495	154.8126	152.6199	136.1027	129.7921	143.6973	143.8479	160.8525	169.6600	181.7284	(219)
Water heating fuel used												1896.5072	(219)
Annual totals kWh/year													
Space heating fuel - main system												1582.4656	(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)													89.3496 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													164.3496 (231)
Electricity for lighting (calculated in Appendix L)													305.6510 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3948.9734 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1582.4656	3.6300	57.4435 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1896.5072	3.6300	68.8432 (247)
Mechanical ventilation fans	89.3496	19.4400	17.3696 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	305.6510	19.4400	59.4186 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	19.4400	0.0000 (252)
Total energy cost			312.6548 (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	1582.4656	0.2160	341.8126 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1896.5072	0.2160	409.6456 (264)
Space and water heating			751.4581 (265)
Pumps and fans	164.3496	0.5190	85.2974 (267)
Energy for lighting	305.6510	0.5190	158.6329 (268)
Energy saving/generation technologies			
PV Unit	-723.0500	0.5190	-375.2630 (269)
Total kg/year			620.1255 (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	1582.4656	1.2200	1930.6081 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1896.5072	1.2200	2313.7388 (264)
Space and water heating			4244.3468 (265)
Pumps and fans	164.3496	3.0700	504.5532 (267)
Energy for lighting	305.6510	3.0700	938.3486 (268)
Energy saving/generation technologies			
PV Unit	-723.0500	3.0700	-2219.7635 (269)
Primary energy kWh/year			3467.4851 (272)
Primary energy kWh/m2/year			55.2147 (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	£91	£91	£0
Mains gas	£221	£221	£0
Space heating	£184	£184	£0
Water heating	£69	£69	£0
Lighting	£59	£59	£0
Total cost of fuels	£312	£312	£0
Total cost of uses	£312	£312	£0
Delivered energy	63 kWh/m²	63 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	55 kWh/m²	55 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 96	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	14 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	83 B	DER	13.75	TER	18.87
Environmental	91 B	% DER<TER	27.13		
CO ₂ Emissions (t/year)	0.62	DFEE	46.27	TFEE	47.46
General Requirements Compliance	Pass	% DFEE<TFEE	2.49		

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 96	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	14 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	83 B	DER	13.75	TER	18.87
Environmental	91 B	% DER<TER	27.13		
CO ₂ Emissions (t/year)	0.62	DFEE	46.27	TFEE	47.46
General Requirements Compliance	Pass	% DFEE<TFEE	2.49		

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 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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 96	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Property	14 Haines Crescent, WEST END, SO30 3LG		
SAP Rating	83 B	DER	13.75
Environmental	91 B	TER	18.87
CO ₂ Emissions (t/year)	0.62	% DER<TER	27.13
General Requirements Compliance	Pass	DfEE	46.27
		TFEE	47.46
		% DfEE<TFEE	2.49
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 East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Semi-Detached
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Ground Floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
		35.85 m	62.80 m ²	2.38 m
7.0 Living Area	25.53	m ²		
8.0 Thermal Mass Parameter	Simple calculation - Medium			
Thermal Mass	250.00	kJ/m ² K		

9.0 External Walls

Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Ground Floor Walls	Cavity Wall	0.27	66.01	57.44
Wall to Corridor	Cavity Wall	0.25	19.31	17.19

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Party Wall 1	Filled Cavity with Edge Sealing		0.00	8.25

10.1 Party Ceilings

Description	Construction	Area (m ²)
-------------	--------------	------------------------

11.1 Party Floors

Description	Construction	Area (m ²)
-------------	--------------	------------------------

12.0 Opening Types

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door							1.10
Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Flat Entrance Door	Solid Door	[2] Wall to Corridor	South East							2.12	
North East	Window	[1] Ground Floor Walls	North East	None	0.00					4.01	
Side Elevation	Window	[1] Ground Floor Walls	North West	None	0.00					4.56	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

Yes

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	7.20	0.300	No
Table K1 - Approved	E3 Sill	6.29	0.040	No
Table K1 - Approved	E4 Jamb	17.10	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	71.70	0.070	No
Table K1 - Approved	E16 Corner (normal)	9.54	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	4.77	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	2.38	0.060	No
Table K1 - Default	E25 Staggered party wall between dwellings	2.38	0.120	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.92	0.000	No

Y-value 0.107 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀

5.00

m³/(h.m²) @ 50 Pa

Property Tested ?

Yes

As Built AP₅₀

4.23

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Wet Rooms

1

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	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

Community Heating

None

28.0 Water Heating

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	901	
29.0 Hot Water Cylinder	None	
32.0 Photovoltaic Unit	More Dwellings, One Block	
Apportioned	723.05	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	13.75	18.87	27.13 %
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	128.65	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	46.27	47.46	2.49 %
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	433.79	453.69	
Average DFEE = 48.32 kWh/m ² /yr		% DFEE/TFEE	PASS		
Average TFEE = 50.55 kWh/m ² /yr		4.41 %			