



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 10 Haines Crescent
WEST END, SO30 3LG

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

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 93			Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)		
Property	10 Haines Crescent, WEST END, SO30 3LG				
SAP Rating	81 B	DER	17.57	TER	22.24
Environmental	88 B	% DER<TER	20.99		
CO ₂ Emissions (t/year)	0.83	DFEE	61.71	TFEE	65.13
General Requirements Compliance	Pass	% DFEE<TFEE	5.24		
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)	22.24	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.57	kgCO ₂ /m ²	Pass
	-4.67 (-21.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	65.13	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	61.71	kWh/m ² /yr	
	-3.4 (-5.2%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.19 (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

4.46 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

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Floor U-value

0.12

W/m²K

Door U-value

1.10

W/m²K

Photovoltaic array

725.47

kWh/Year

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THERMAL BRIDGING

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SAP Rating	81 B	DER	17.57	TER	22.24
Environmental	88 B	% DER<TER	20.99		
CO ₂ Emissions (t/year)	0.83	DFEE	61.71	TFEE	65.13
General Requirements Compliance	Pass	% DFEE<TFEE	5.24		

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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	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	18.30	0.92	
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	32.44	5.19	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	32.44	2.27	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	10.72	0.96	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	5.36	-0.48	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	2.68	0.16	
External wall	E25 Staggered party wall between dwellings	Table K1 - Default	0.120	2.68	0.32	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	3.45	0.55	
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	3.45	0.00	

Total: **12.30** W/mK:
Y-Value: **0.077** W/m²K:

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Ground-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) 22.24 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.57 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)65.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)61.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	4.19 (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
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6 Controls

Space heating controls:	Programmer, room thermostat and TRVs	OK
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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
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Based on:

Overshading:	Average
Windows facing North East:	4.46 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
Floor U-value	0.12 W/m ² K
Door U-value	1.10 W/m ² K
Photovoltaic array	725.47 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	63.0100 (1b)	x 2.6800 (2b)	= 168.8668 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.8668 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1900
Infiltration rate					0.2095 (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) =				0.1938 (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	0.2471	0.2422	0.2374	0.2132	0.2083	0.1841	0.1841	0.1793	0.1938	0.2083	0.2180	0.2277 (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)			9.0200	1.1450	10.3282		(27)
Heat Loss Floor 1			63.0100	0.1200	7.5612		(28a)
Ground Floor Walls	74.7500	9.0200	65.7300	0.2700	17.7471		(29a)
Wall to Corridor	21.4400	2.1200	19.3200	0.2041	3.9429		(29a)
Total net area of external elements Aum(A, m2)			159.2000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.9114		(33)
Party Wall 1			9.2500	0.0000	0.0000		(32)
Party Ceilings 1			62.8600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.3046 (36)
Total fabric heat loss							(33) + (36) = 54.2160 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630 (38)
Heat transfer coeff	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790 (39)
Average = Sum(39)m / 12 =												82.0790 (39)
HLP	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026 (40)
HLP (average)												1.3026 (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												2.0653 (42)
Average daily hot water use (litres/day)												83.2517 (43)
Daily hot water use	91.5769	88.2468	84.9167	81.5867	78.2566	74.9265	74.9265	78.2566	81.5867	84.9167	88.2468	91.5769 (44)
Energy conte	135.8059	118.7767	122.5669	106.8568	102.5316	88.4770	81.9869	94.0812	95.2048	110.9521	121.1129	131.5207 (45)
Energy content (annual)												Total = Sum(45)m = 1309.8734 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3709	17.8165	18.3850	16.0285	15.3797	13.2715	12.2980	14.1122	14.2807	16.6428	18.1669	19.7281 (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	31.1864	28.1541	31.1478	30.1173	31.1025	30.0777	31.0668	31.0900	30.0993	31.1291	30.1548	31.1789	(61)
Total heat required for water heating calculated for each month	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	162.6996	(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	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	162.6996	(64)
Heat gains from water heating, kWh/month	52.9520	46.5318	48.5404	43.0592	41.8674	36.9380	35.0274	39.0545	39.1804	44.6738	47.8087	51.5254	(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	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.1775	15.2569	12.4077	9.3935	7.0217	5.9280	6.4054	8.3260	11.1752	14.1895	16.5612	17.6549	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.4694	182.3421	177.6230	167.5764	154.8945	142.9752	135.0124	133.1397	137.8589	147.9054	160.5874	172.5066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	(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)	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	(71)
Water heating gains (Table 5)	71.1721	69.2437	65.2425	59.8045	56.2734	51.3028	47.0798	52.4926	54.4173	60.0455	66.4010	69.2545	(72)
Total internal gains	325.7990	323.8227	312.2533	293.7544	275.1696	257.1861	245.4777	250.9384	260.4314	279.1204	300.5296	316.3961	(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				4.4600	11.2829	0.6300	0.7000	0.7700		15.3790 (75)
Northwest				4.5600	11.2829	0.6300	0.7000	0.7700		15.7239 (81)
Solar gains	31.1029	63.3108	114.0660	187.3291	251.8071	268.4530	251.1322	200.2055	138.9912	77.3708 39.1355 25.4002 (83)
Total gains	356.9019	387.1336	426.3192	481.0835	526.9766	525.6390	496.6099	451.1439	399.4225	356.4913 339.6651 341.7963 (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	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108		
alpha	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541		
util living area	0.9984	0.9974	0.9940	0.9807	0.9343	0.8197	0.6712	0.7403	0.9298	0.9890	0.9972	0.9987	(86)	
MIT	19.5289	19.6436	19.8886	20.2439	20.6071	20.8630	20.9596	20.9368	20.7173	20.2734	19.8367	19.4953	(87)	
Th 2	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	(88)	
util rest of house	0.9978	0.9964	0.9916	0.9720	0.9021	0.7293	0.5204	0.5958	0.8804	0.9827	0.9960	0.9982	(89)	
MIT 2	18.5056	18.6200	18.8641	19.2149	19.5594	19.7711	19.8280	19.8192	19.6656	19.2471	18.8131	18.4721	(90)	
Living area fraction	18.9211	19.0355	19.2800	19.6326	19.9847	20.2144	20.2874	20.2729	20.0926	19.6637	19.2286	18.8875	(92)	
Temperature adjustment	18.9211	19.0355	19.2800	19.6326	19.9847	20.2144	20.2874	20.2729	20.0926	19.6637	19.2286	18.8875	(93)	
adjusted MIT	18.9211	19.0355	19.2800	19.6326	19.9847	20.2144	20.2874	20.2729	20.0926	19.6637	19.2286	18.8875	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	355.8989	385.3890	422.0985	466.6924	477.9359	400.6417	289.4191	295.6377	356.9796	349.8674	337.9894	341.0085	(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	1200.0834	1160.2314	1048.9727	880.9246	680.0007	460.8260	302.6599	317.8854	491.8647	743.9437	995.5054	1205.5347	(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	628.0733	520.6941	466.3944	298.2472	150.3363	0.0000	0.0000	0.0000	0.0000	293.1927	473.4115	643.2075	(98)
Space heating												3473.5570	(98)
Space heating per m ²												55.1271	(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													3829.7211 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	628.0733	520.6941	466.3944	298.2472	150.3363	0.0000	0.0000	0.0000	0.0000	293.1927	473.4115	643.2075	(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)	692.4733	574.0839	514.2166	328.8282	165.7511	0.0000	0.0000	0.0000	0.0000	323.2555	521.9532	709.1593	(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	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	162.6996	(64)
Efficiency of water heater (217)m	89.8970	89.8589	89.7538	89.5020	88.9204	87.0000	87.0000	87.0000	87.0000	89.4581	89.7755	89.9279	(216)
Fuel for water heating, kWh/month	185.7595	163.5126	171.2626	153.0402	150.2852	136.2697	129.9468	143.8749	144.0277	158.8242	168.4955	180.9223	(219)
Water heating fuel used													1886.2215 (219)
Annual totals kWh/year													
Space heating fuel - main system													3829.7211 (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)													100.9486 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													175.9486 (231)
Electricity for lighting (calculated in Appendix L)													303.3599 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													6195.2511 (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	3829.7211	0.2160	827.2198 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1886.2215	0.2160	407.4239 (264)
Space and water heating			1234.6436 (265)
Pumps and fans	175.9486	0.5190	91.3173 (267)
Energy for lighting	303.3599	0.5190	157.4438 (268)
Energy saving/generation technologies			
PV Unit	-725.4700	0.5190	-376.5189 (269)
Total CO2, kg/year			1106.8858 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.5700 (273)

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

DER			17.5700 ZC1
Total Floor Area		TFA	63.0100
Assumed number of occupants		N	2.0653
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.9723 ZC2
CO2 emissions from cooking, equation (L16)			2.6753 ZC3
Total CO2 emissions			37.2175 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			37.2175 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.0100 (1b)	x 2.6800 (2b)	= 168.8668 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.8668 (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) = 0.1184 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3684 (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) =				0.3408 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4345	0.4260	0.4175	0.3749	0.3664	0.3238	0.3238	0.3152	0.3408	0.3664	0.3834	0.4004 (22b)
Effective ac	0.5944	0.5907	0.5871	0.5703	0.5671	0.5524	0.5524	0.5497	0.5581	0.5671	0.5735	0.5802 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			9.0200	1.3258	11.9583		(27)
Heat Loss Floor 1			63.0100	0.1300	8.1913		(28a)
Ground Floor Walls	74.7500	9.0200	65.7300	0.1800	11.8314		(29a)
Wall to Corridor	21.4400	2.1200	19.3200	0.1800	3.4776		(29a)
Total net area of external elements Aum(A, m ²)			159.2000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.5786	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1307 (36)
Total fabric heat loss						(33) + (36) =	47.7093 (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	33.1239	32.9196	32.7194	31.7788	31.6029	30.7837	30.7837	30.6320	31.0992	31.6029	31.9589	32.3310 (38)
Heat transfer coeff	80.8332	80.6289	80.4287	79.4882	79.3122	78.4930	78.4930	78.3413	78.8086	79.3122	79.6682	80.0404 (39)
Average = Sum(39)m / 12 =												79.4873 (39)
HLP	1.2829	1.2796	1.2764	1.2615	1.2587	1.2457	1.2457	1.2433	1.2507	1.2587	1.2644	1.2703 (40)
HLP (average)												1.2615 (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												2.0653 (42)
Average daily hot water use (litres/day)												83.2517 (43)
Daily hot water use	91.5769	88.2468	84.9167	81.5867	78.2566	74.9265	74.9265	78.2566	81.5867	84.9167	88.2468	91.5769 (44)
Energy conte	135.8059	118.7767	122.5669	106.8568	102.5316	88.4770	81.9869	94.0812	95.2048	110.9521	121.1129	131.5207 (45)
Energy content (annual)										Total = Sum(45)m =		1309.8734 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3709	17.8165	18.3850	16.0285	15.3797	13.2715	12.2980	14.1122	14.2807	16.6428	18.1669	19.7281 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Combi loss	46.6666	40.6177	43.2726	40.2345	39.8787	36.9501	38.1817	39.8787	40.2345	43.2726	43.5190	46.6666 (61)
Total heat required for water heating calculated for each month	182.4724	159.3944	165.8395	147.0913	142.4103	125.4271	120.1687	133.9599	135.4394	154.2247	164.6318	178.1873 (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	182.4724	159.3944	165.8395	147.0913	142.4103	125.4271	120.1687	133.9599	135.4394	154.2247	164.6318	178.1873 (64)
Heat gains from water heating, kWh/month	56.8221	49.6477	51.5716	45.5885	44.0614	38.6561	36.8061	41.2517	41.7142	47.7097	51.1498	55.3973 (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	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.1775	15.2569	12.4077	9.3935	7.0217	5.9280	6.4054	8.3260	11.1752	14.1895	16.5612	17.6549	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.4694	182.3421	177.6230	167.5764	154.8945	142.9752	135.0124	133.1397	137.8589	147.9054	160.5874	172.5066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	(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)	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	(71)
Water heating gains (Table 5)	76.3738	73.8805	69.3167	63.3174	59.2224	53.6891	49.4706	55.4458	57.9364	64.1260	71.0413	74.4587	(72)
Total internal gains	331.0007	328.4595	316.3275	297.2673	278.1186	259.5723	247.8685	253.8916	263.9506	283.2009	305.1700	321.6003	(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				4.4600	11.2829		0.6300		0.7000	0.7700	15.3790 (75)	
Northwest				4.5600	11.2829		0.6300		0.7000	0.7700	15.7239 (81)	

Solar gains	31.1029	63.3108	114.0660	187.3291	251.8071	268.4530	251.1322	200.2055	138.9912	77.3708	39.1355	25.4002 (83)
Total gains	362.1036	391.7703	430.3934	484.5964	529.9256	528.0253	499.0007	454.0971	402.9417	360.5717	344.3054	347.0004 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.1324	54.2695	54.4046	55.0484	55.1705	55.7463	55.7463	55.8542	55.5231	55.1705	54.9240	54.6686	
alpha	4.6088	4.6180	4.6270	4.6699	4.6780	4.7164	4.7164	4.7236	4.7015	4.6780	4.6616	4.6446	
util living area	0.9983	0.9972	0.9937	0.9794	0.9292	0.8039	0.6493	0.7187	0.9227	0.9882	0.9970	0.9986	(86)
MIT	19.5616	19.6787	19.9240	20.2883	20.6417	20.8859	20.9687	20.9501	20.7483	20.3152	19.8843	19.5442	(87)
Th 2	19.8543	19.8568	19.8593	19.8711	19.8733	19.8836	19.8836	19.8855	19.8796	19.8733	19.8688	19.8642	(88)
util rest of house	0.9977	0.9962	0.9913	0.9704	0.8957	0.7134	0.5052	0.5784	0.8711	0.9815	0.9958	0.9981	(89)
MIT 2	17.9444	18.1173	18.4769	19.0113	19.5017	19.8020	19.8715	19.8631	19.6556	19.0565	18.4266	17.9257	(90)
Living area fraction									fLA = Living area / (4) =			0.4060	(91)
MIT	18.6009	18.7512	19.0644	19.5297	19.9645	20.2420	20.3169	20.3044	20.0992	19.5675	19.0184	18.5828	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6009	18.7512	19.0644	19.5297	19.9645	20.2420	20.3169	20.3044	20.0992	19.5675	19.0184	18.5828	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9967	0.9948	0.9888	0.9668	0.8989	0.7456	0.5644	0.6356	0.8835	0.9790	0.9943	0.9973	(94)
Ext temp.	360.9209	389.7487	425.5931	468.5000	476.3722	393.7205	281.6419	288.6392	355.9978	353.0028	342.3599	346.0756	(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	1155.9902	1116.8038	1010.5364	844.9379	655.4739	442.8580	291.7519	305.8783	472.7896	711.2305	949.5163	1151.2011	(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	591.5316	488.5810	435.1978	271.0353	133.2517	0.0000	0.0000	0.0000	0.0000	266.5214	437.1526	599.0134	(98)
Space heating per m2												3222.2847	(98)
										(98) / (4) =		51.1393	(99)

8c. Space cooling requirement

Not applicable

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

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3449.9836 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	591.5316	488.5810	435.1978	271.0353	133.2517	0.0000	0.0000	0.0000	0.0000	266.5214	437.1526	599.0134	(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)	633.3315	523.1060	465.9505	290.1877	142.6678	0.0000	0.0000	0.0000	0.0000	285.3548	468.0434	641.3419	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	182.4724	159.3944	165.8395	147.0913	142.4103	125.4271	120.1687	133.9599	135.4394	154.2247	164.6318	178.1873	(64)
Efficiency of water heater	87.7966	87.6870	87.3679	86.5695	84.8843	80.3000	80.3000	80.3000	80.3000	86.4159	87.3929	87.8662	(217)
(217)m													
Fuel for water heating, kWh/month	207.8354	181.7766	189.8175	169.9111	167.7699	156.1981	149.6497	166.8243	168.6667	178.4680	188.3813	202.7939	(219)
Water heating fuel used												2128.0924	(219)
Annual totals kWh/year													
Space heating fuel - main system												3449.9836	(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)												303.3599	(232)
Total delivered energy for all uses												5956.4359	(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	3449.9836	0.2160	745.1965 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2128.0924	0.2160	459.6680 (264)
Space and water heating			1204.8644 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	303.3599	0.5190	157.4438 (268)
Total CO2, kg/m2/year			1401.2332 (272)
Emissions per m2 for space and water heating			19.1218 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4987 (272b)
Emissions per m2 for pumps and fans			0.6178 (272c)
Target Carbon Dioxide Emission Rate (TER) = (19.1218 * 1.00) + 2.4987 + 0.6178, rounded to 2 d.p.			22.2400 (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	63.0100 (1b)	x 2.6800 (2b)	= 168.8668 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.8668 (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) = 0.1184 (8)
Measured/design AP50					Yes
Infiltration rate					4.1900
Number of sides sheltered					0.3279 (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) =				0.3033 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3868	0.3792	0.3716	0.3337	0.3261	0.2882	0.2882	0.2806	0.3033	0.3261	0.3413	0.3564 (22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635 (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)			9.0200	1.1450	10.3282		(27)
Heat Loss Floor 1			63.0100	0.1200	7.5612		(28a)
Ground Floor Walls	74.7500	9.0200	65.7300	0.2700	17.7471		(29a)
Wall to Corridor	21.4400	2.1200	19.3200	0.2041	3.9429		(29a)
Total net area of external elements Aum(A, m ²)			159.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.9114		(33)
Party Wall 1			9.2500	0.0000	0.0000		(32)
Party Ceilings 1			62.8600				(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)							12.3046 (36)
Total fabric heat loss						(33) + (36) =	54.2160 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.0309	31.8690	31.7104	30.9653	30.8259	30.1769	30.1769	30.0567	30.4269	30.8259	31.1079	31.4027 (38)
Heat transfer coeff	86.2469	86.0850	85.9264	85.1813	85.0419	84.3929	84.3929	84.2727	84.6429	85.0419	85.3239	85.6187 (39)
Average = Sum(39)m / 12 =												85.1806 (39)
HLP	1.3688	1.3662	1.3637	1.3519	1.3497	1.3394	1.3394	1.3374	1.3433	1.3497	1.3541	1.3588 (40)
HLP (average)												1.3519 (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												2.0653 (42)
Average daily hot water use (litres/day)												83.2517 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	91.5769	88.2468	84.9167	81.5867	78.2566	74.9265	74.9265	78.2566	81.5867	84.9167	88.2468	91.5769 (44)
Energy content (annual)	135.8059	118.7767	122.5669	106.8568	102.5316	88.4770	81.9869	94.0812	95.2048	110.9521	121.1129	131.5207 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1309.8734 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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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	28.8587	25.2400	26.0455	22.7071	21.7880	18.8014	17.4222	19.9923	20.2310	23.5773	25.7365	27.9482 (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	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.1775	15.2569	12.4077	9.3935	7.0217	5.9280	6.4054	8.3260	11.1752	14.1895	16.5612	17.6549	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.4694	182.3421	177.6230	167.5764	154.8945	142.9752	135.0124	133.1397	137.8589	147.9054	160.5874	172.5066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	(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)	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	(71)
Water heating gains (Table 5)	38.7886	37.5596	35.0073	31.5376	29.2849	26.1130	23.4170	26.8713	28.0987	31.6899	35.7451	37.5647	(72)
Total internal gains	290.4156	289.1386	279.0181	262.4875	245.1811	228.9963	218.8149	222.3171	231.1128	247.7649	266.8737	281.7063	(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				4.4600	11.2829	0.6300		0.7000	0.7700		15.3790 (75)		
Northwest				4.5600	11.2829	0.6300		0.7000	0.7700		15.7239 (81)		

Solar gains	31.1029	63.3108	114.0660	187.3291	251.8071	268.4530	251.1322	200.2055	138.9912	77.3708	39.1355	25.4002 (83)	
Total gains	321.5184	352.4494	393.0840	449.8166	496.9882	497.4492	469.9471	422.5226	370.1039	325.1357	306.0092	307.1065 (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	50.7345	50.8299	50.9238	51.3692	51.4534	51.8491	51.8491	51.9230	51.6960	51.4534	51.2833	51.1067	
alpha	4.3823	4.3887	4.3949	4.4246	4.4302	4.4566	4.4566	4.4615	4.4464	4.4302	4.4189	4.4071	
util living area	0.9989	0.9982	0.9957	0.9855	0.9484	0.8487	0.7099	0.7801	0.9474	0.9925	0.9981	0.9991	(86)
MIT	19.3958	19.5170	19.7740	20.1555	20.5404	20.8301	20.9457	20.9163	20.6640	20.1921	19.7346	19.3752	(87)
Th 2	19.7873	19.7893	19.7913	19.8004	19.8021	19.8101	19.8101	19.8116	19.8071	19.8021	19.7987	19.7951	(88)
util rest of house	0.9985	0.9975	0.9939	0.9787	0.9211	0.7631	0.5544	0.6360	0.9066	0.9880	0.9973	0.9988	(89)
MIT 2	18.3329	18.4554	18.7133	19.0985	19.4695	19.7235	19.7952	19.7845	19.5946	19.1386	18.6802	18.3183	(90)
Living area fraction									fLA = Living area / (4) =			0.4060	(91)
MIT	18.7644	18.8864	19.1439	19.5276	19.9043	20.1727	20.2623	20.2440	20.0287	19.5663	19.1082	18.7474	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7644	18.8864	19.1439	19.5276	19.9043	20.1727	20.2623	20.2440	20.0287	19.5663	19.1082	18.7474	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	320.8910	351.3125	390.1948	439.3298	459.1872	394.5295	290.8727	293.7734	339.1118	320.8210	304.9784	306.6226	(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	1247.5113	1204.0184	1086.4476	905.2719	697.7081	470.3004	309.0680	323.9452	501.8257	762.5113	1024.5892	1245.5260	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	689.4055	573.0184	518.0121	335.4783	177.4596	0.0000	0.0000	0.0000	0.0000	328.6176	518.1198	698.5442	(98)
Space heating												3838.6554	(98)
Space heating per m2										(98) / (4) =		60.9214	(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	793.2932	624.5074	640.4726	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7340	0.8172	0.7673	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	582.2381	510.3551	491.4300	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	658.8692	625.2369	571.1729	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	55.1744	85.4720	59.3288	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												199.9752	(104)

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Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	13.7936	21.3680	14.8322	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												49.9938 (107)
Space cooling per m2												0.7934 (108)
Energy for space heating												60.9214 (99)
Energy for space cooling												0.7934 (108)
Total												61.7148 (109)
Dwelling Fabric Energy Efficiency (DFEE)												61.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.0100 (1b)	x 2.6800 (2b)	= 168.8668 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.8668 (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) = 0.1184 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3684 (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) =	0.3408 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4345	0.4260	0.4175	0.3749	0.3664	0.3238	0.3238	0.3152	0.3408	0.3664	0.3834	0.4004 (22b)
	0.5944	0.5907	0.5871	0.5703	0.5671	0.5524	0.5524	0.5497	0.5581	0.5671	0.5735	0.5802 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			9.0200	1.3258	11.9583		(27)
Heat Loss Floor 1			63.0100	0.1300	8.1913		(28a)
Ground Floor Walls	74.7500	9.0200	65.7300	0.1800	11.8314		(29a)
Wall to Corridor	21.4400	2.1200	19.3200	0.1800	3.4776		(29a)
Total net area of external elements Aum(A, m ²)			159.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5786		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1307 (36)
Total fabric heat loss						(33) + (36) =	47.7093 (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	33.1239	32.9196	32.7194	31.7788	31.6029	30.7837	30.7837	30.6320	31.0992	31.6029	31.9589	32.3310 (38)
Heat transfer coeff	80.8332	80.6289	80.4287	79.4882	79.3122	78.4930	78.4930	78.3413	78.8086	79.3122	79.6682	80.0404 (39)
Average = Sum(39)m / 12 =												79.4873 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2829	1.2796	1.2764	1.2615	1.2587	1.2457	1.2457	1.2433	1.2507	1.2587	1.2644	1.2703 (40)
HLP (average)												1.2615 (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												2.0653 (42)
Average daily hot water use (litres/day)												83.2517 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.5769	88.2468	84.9167	81.5867	78.2566	74.9265	74.9265	78.2566	81.5867	84.9167	88.2468	91.5769 (44)
Energy conte	135.8059	118.7767	122.5669	106.8568	102.5316	88.4770	81.9869	94.0812	95.2048	110.9521	121.1129	131.5207 (45)
Energy content (annual)										Total = Sum(45)m =		1309.8734 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	28.8587	25.2400	26.0455	22.7071	21.7880	18.8014	17.4222	19.9923	20.2310	23.5773	25.7365	27.9482 (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	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	103.2667	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.1775	15.2569	12.4077	9.3935	7.0217	5.9280	6.4054	8.3260	11.1752	14.1895	16.5612	17.6549	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.4694	182.3421	177.6230	167.5764	154.8945	142.9752	135.0124	133.1397	137.8589	147.9054	160.5874	172.5066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	33.3267	(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)	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	(71)
Water heating gains (Table 5)	38.7886	37.5596	35.0073	31.5376	29.2849	26.1130	23.4170	26.8713	28.0987	31.6899	35.7451	37.5647	(72)
Total internal gains	290.4156	289.1386	279.0181	262.4875	245.1811	228.9963	218.8149	222.3171	231.1128	247.7649	266.8737	281.7063	(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				4.4600	11.2829	0.6300	0.7000	0.7700	15.3790 (75)			
Northwest				4.5600	11.2829	0.6300	0.7000	0.7700	15.7239 (81)			
Solar gains	31.1029	63.3108	114.0660	187.3291	251.8071	268.4530	251.1322	200.2055	138.9912	77.3708	39.1355	25.4002 (83)
Total gains	321.5184	352.4494	393.0840	449.8166	496.9882	497.4492	469.9471	422.5226	370.1039	325.1357	306.0092	307.1065 (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	54.1324	54.2695	54.4046	55.0484	55.1705	55.7463	55.7463	55.8542	55.5231	55.1705	54.9240	54.6686	
alpha	4.6088	4.6180	4.6270	4.6699	4.6780	4.7164	4.7164	4.7236	4.7015	4.6780	4.6616	4.6446	
util living area	0.9990	0.9982	0.9957	0.9845	0.9424	0.8291	0.6799	0.7539	0.9411	0.9922	0.9982	0.9992	(86)
MIT	19.5029	19.6221	19.8711	20.2419	20.6065	20.8683	20.9621	20.9387	20.7139	20.2659	19.8291	19.4863	(87)
Th 2	19.8543	19.8568	19.8593	19.8711	19.8733	19.8836	19.8836	19.8855	19.8796	19.8733	19.8688	19.8642	(88)
util rest of house	0.9986	0.9976	0.9939	0.9775	0.9136	0.7427	0.5334	0.6146	0.8982	0.9876	0.9974	0.9989	(89)
MIT 2	18.4918	18.6128	18.8631	19.2395	19.5894	19.8173	19.8732	19.8659	19.6995	19.2677	18.8292	18.4830	(90)
Living area fraction									fLA = Living area / (4) =			0.4060	(91)
MIT	18.9023	19.0225	19.2723	19.6464	20.0023	20.2440	20.3153	20.3014	20.1113	19.6729	19.2351	18.8903	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9023	19.0225	19.2723	19.6464	20.0023	20.2440	20.3153	20.3014	20.1113	19.6729	19.2351	18.8903	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9982	0.9969	0.9927	0.9757	0.9176	0.7741	0.5940	0.6720	0.9093	0.9865	0.9968	0.9986	(94)
Ext temp.	320.9346	351.3658	390.2224	438.8728	456.0128	385.0792	279.1503	283.9248	336.5220	320.7530	305.0270	306.6618	(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	1180.3498	1138.6844	1027.2616	854.2124	658.4774	443.0119	291.6235	305.6421	473.7435	719.5947	966.7838	1175.8150	(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	639.4050	529.0781	473.9572	299.0445	150.6337	0.0000	0.0000	0.0000	0.0000	296.7382	476.4649	646.6500	(98)
Space heating												3511.9715	(98)
Space heating per m2												55.7367	(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	737.8346	580.8485	595.3942	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7754	0.8540	0.8077	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.0876	496.0447	480.9106	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	658.8692	625.2369	571.1729	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	62.4827	96.1190	67.1552	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												225.7570	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	15.6207	24.0298	16.7888	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												56.4392 (107)
Energy for space heating												0.8957 (108)
Energy for space cooling												55.7367 (99)
Total												0.8957 (108)
Target Fabric Energy Efficiency (TFEE)												56.6325 (109)
												65.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.0100 (1b)	x 2.6800 (2b)	= 168.8668 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.8668 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1900
Infiltration rate					0.2095 (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) =				0.1938 (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	0.2277	0.2132	0.2132	0.1938	0.1986	0.1889	0.1889	0.1841	0.1841	0.1986	0.1938	0.1986 (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)			9.0200	1.1450	10.3282		(27)
Heat Loss Floor 1			63.0100	0.1200	7.5612		(28a)
Ground Floor Walls	74.7500	9.0200	65.7300	0.2700	17.7471		(29a)
Wall to Corridor	21.4400	2.1200	19.3200	0.2041	3.9429		(29a)
Total net area of external elements Aum(A, m2)			159.2000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.9114		(33)
Party Wall 1			9.2500	0.0000	0.0000		(32)
Party Ceilings 1			62.8600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.3046 (36)
Total fabric heat loss							(33) + (36) = 54.2160 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630 (38)
Heat transfer coeff	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790 (39)
Average = Sum(39)m / 12 =												82.0790 (39)
HLP	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026 (40)
HLP (average)												1.3026 (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												2.0653 (42)
Average daily hot water use (litres/day)												83.2517 (43)
Daily hot water use	91.5769	88.2468	84.9167	81.5867	78.2566	74.9265	74.9265	78.2566	81.5867	84.9167	88.2468	91.5769 (44)
Energy conte	135.8059	118.7767	122.5669	106.8568	102.5316	88.4770	81.9869	94.0812	95.2048	110.9521	121.1129	131.5207 (45)
Energy content (annual)												Total = Sum(45)m = 1309.8734 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3709	17.8165	18.3850	16.0285	15.3797	13.2715	12.2980	14.1122	14.2807	16.6428	18.1669	19.7281 (46)

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	31.1864	28.1541	31.1478	30.1173	31.1025	30.0777	31.0668	31.0900	30.0993	31.1291	30.1548	31.1789	(61)
Total heat required for water heating calculated for each month	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	162.6996	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =					0.0000 (63)
Output from w/h	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	162.6996	(64)
								Total per year (kWh/year) = Sum(64)m =					1676.3781 (64)
RHI water heating demand												1676	(64)
Heat gains from water heating, kWh/month	52.9520	46.5318	48.5404	43.0592	41.8674	36.9380	35.0274	39.0545	39.1804	44.6738	47.8087	51.5254	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	42.9437	38.1422	31.0194	23.4837	17.5543	14.8201	16.0136	20.8151	27.9380	35.4737	41.4031	44.1373 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	269.3573	272.1524	265.1089	250.1141	231.1858	213.3958	201.5111	198.7160	205.7595	220.7544	239.6827	257.4726 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573 (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)	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134 (71)
Water heating gains (Table 5)	71.1721	69.2437	65.2425	59.8045	56.2734	51.3028	47.0798	52.4926	54.4173	60.0455	66.4010	69.2545 (72)
Total internal gains	477.2372	473.3024	455.1348	427.1662	398.7775	373.2828	358.3685	365.7878	381.8788	410.0376	441.2507	464.6284 (73)

[Jan				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	or Table 6b		Specific data	factor		W	
					W/m2			or Table 6c	Table 6d			
Northeast				4.4600	14.6130	0.6300		0.7000	0.7700		19.9181 (75)	
Northwest				4.5600	14.6130	0.6300		0.7000	0.7700		20.3647 (81)	

Solar gains	40.2827	70.2862	129.4551	212.7248	267.3648	314.2465	282.9108	236.7205	165.0474	92.9091	50.6390	31.0635 (83)
Total gains	517.5199	543.5886	584.5900	639.8910	666.1423	687.5293	641.2793	602.5082	546.9263	502.9467	491.8897	495.6920 (84)

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	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108
alpha	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541
util living area	0.9898	0.9864	0.9728	0.9267	0.8087	0.5823	0.4175	0.4303	0.7423	0.9349	0.9808	0.9912 (86)
MIT	19.9098	19.9921	20.2297	20.5625	20.8409	20.9735	20.9955	20.9951	20.9222	20.6225	20.2237	19.8913 (87)
Th 2	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388 (88)
util rest of house	0.9862	0.9815	0.9626	0.8979	0.7365	0.4621	0.2732	0.2772	0.6271	0.9010	0.9725	0.9880 (89)
MIT 2	18.8841	18.9653	19.1981	19.5128	19.7481	19.8307	19.8383	19.8383	19.8078	19.5748	19.1948	18.8661 (90)
Living area fraction												0.4060 (91)
MIT	19.3005	19.3821	19.6169	19.9390	20.1918	20.2946	20.3081	20.3079	20.2602	20.0001	19.6125	19.2823 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3005	19.3821	19.6169	19.9390	20.1918	20.2946	20.3081	20.3079	20.2602	20.0001	19.6125	19.2823 (93)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.0100 (1b)	x 2.6800 (2b)	= 168.8668 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.8668 (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					4.1900
Infiltration rate					0.2095 (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) =				0.1938 (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	0.2471	0.2422	0.2374	0.2132	0.2083	0.1841	0.1841	0.1793	0.1938	0.2083	0.2180	0.2277 (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)			9.0200	1.1450	10.3282		(27)
Heat Loss Floor 1			63.0100	0.1200	7.5612		(28a)
Ground Floor Walls	74.7500	9.0200	65.7300	0.2700	17.7471		(29a)
Wall to Corridor	21.4400	2.1200	19.3200	0.2041	3.9429		(29a)
Total net area of external elements Aum(A, m2)			159.2000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.9114		(33)
Party Wall 1			9.2500	0.0000	0.0000		(32)
Party Ceilings 1			62.8600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.3046 (36)
Total fabric heat loss							(33) + (36) = 54.2160 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630 (38)
Heat transfer coeff	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790 (39)
Average = Sum(39)m / 12 =												82.0790 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026 (40)
HLP (average)												1.3026 (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												2.0653 (42)
Average daily hot water use (litres/day)												83.2517 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.5769	88.2468	84.9167	81.5867	78.2566	74.9265	74.9265	78.2566	81.5867	84.9167	88.2468	91.5769 (44)
Energy conte	135.8059	118.7767	122.5669	106.8568	102.5316	88.4770	81.9869	94.0812	95.2048	110.9521	121.1129	131.5207 (45)
Energy content (annual)												Total = Sum(45)m = 1309.8734 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3709	17.8165	18.3850	16.0285	15.3797	13.2715	12.2980	14.1122	14.2807	16.6428	18.1669	19.7281 (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	31.1864	28.1541	31.1478	30.1173	31.1025	30.0777	31.0668	31.0900	30.0993	31.1291	30.1548	31.1789	(61)
Total heat required for water heating calculated for each month	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	162.6996	(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	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	162.6996	(64)
Heat gains from water heating, kWh/month	52.9520	46.5318	48.5404	43.0592	41.8674	36.9380	35.0274	39.0545	39.1804	44.6738	47.8087	51.5254	(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	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	42.9437	38.1422	31.0194	23.4837	17.5543	14.8201	16.0136	20.8151	27.9380	35.4737	41.4031	44.1373	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	269.3573	272.1524	265.1089	250.1141	231.1858	213.3958	201.5111	198.7160	205.7595	220.7544	239.6827	257.4726	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	(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)	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	(71)
Water heating gains (Table 5)	71.1721	69.2437	65.2425	59.8045	56.2734	51.3028	47.0798	52.4926	54.4173	60.0455	66.4010	69.2545	(72)
Total internal gains	477.2372	473.3024	455.1348	427.1662	398.7775	373.2828	358.3685	365.7878	381.8788	410.0376	441.2507	464.6284	(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					4.4600	11.2829	0.6300	0.7000	0.7700		15.3790	(75)	
Northwest					4.5600	11.2829	0.6300	0.7000	0.7700		15.7239	(81)	
Solar gains	31.1029	63.3108	114.0660	187.3291	251.8071	268.4530	251.1322	200.2055	138.9912	77.3708	39.1355	25.4002	(83)
Total gains	508.3401	536.6132	569.2008	614.4953	650.5845	641.7357	609.5008	565.9933	520.8700	487.4084	480.3862	490.0286	(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	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108		
alpha	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541		
util living area	0.9931	0.9901	0.9816	0.9540	0.8788	0.7296	0.5690	0.6278	0.8525	0.9650	0.9886	0.9942	(86)	
MIT	19.7443	19.8541	20.0843	20.4099	20.7221	20.9172	20.9792	20.9678	20.8226	20.4442	20.0342	19.7068	(87)	
Th 2	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	(88)	
util rest of house	0.9908	0.9868	0.9749	0.9361	0.8306	0.6300	0.4305	0.4879	0.7764	0.9478	0.9841	0.9923	(89)	
MIT 2	18.7196	18.8285	19.0558	19.3709	19.6537	19.8015	19.8338	19.8300	19.7422	19.4090	19.0081	18.6824	(90)	
Living area fraction	19.1356	19.2449	19.4733	19.7927	20.0874	20.2545	20.2988	20.2919	20.1808	19.8293	19.4247	19.0983	(92)	
Temperature adjustment	19.1356	19.2449	19.4733	19.7927	20.0874	20.2545	20.2988	20.2919	20.1808	19.8293	19.4247	19.0983	(93)	
adjusted MIT	19.1356	19.2449	19.4733	19.7927	20.0874	20.2545	20.2988	20.2919	20.1808	19.8293	19.4247	19.0983	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	502.7534	528.3554	553.4259	574.7021	548.0073	428.9285	297.0801	308.7086	417.7498	461.8724	471.7566	485.4374	(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	1217.6927	1177.4155	1064.8392	894.0618	688.4319	464.1129	303.5905	319.4403	499.1063	757.5287	1011.5961	1222.8374	(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	531.9149	436.1684	380.4915	229.9390	104.4759	0.0000	0.0000	0.0000	0.0000	219.9683	388.6844	548.6256	(98)
Space heating												2840.2679	(98)
Space heating per m ²												45.0765	(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													3131.4971 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	531.9149	436.1684	380.4915	229.9390	104.4759	0.0000	0.0000	0.0000	0.0000	219.9683	388.6844	548.6256	(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)	586.4552	480.8913	419.5055	253.5160	115.1884	0.0000	0.0000	0.0000	0.0000	242.5229	428.5385	604.8794	(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	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	162.6996	(64)
Efficiency of water heater (217)m	89.7876	89.7383	89.6035	89.2825	88.5856	87.0000	87.0000	87.0000	87.0000	89.2111	89.6321	89.8262	(216)
Fuel for water heating, kWh/month	185.9858	163.7324	171.5499	153.4165	150.8531	136.2697	129.9468	143.8749	144.0277	159.2640	168.7650	181.1271	(219)
Water heating fuel used												1888.8133	(219)
Annual totals kWh/year													
Space heating fuel - main system												3131.4971	(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)													100.9486 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													175.9486 (231)
Electricity for lighting (calculated in Appendix L)													303.3599 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													5499.6189 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3131.4971	3.4800	108.9761 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1888.8133	3.4800	65.7307 (247)
Mechanical ventilation fans	100.9486	13.1900	13.3151 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	303.3599	13.1900	40.0132 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			357.9276 (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] =	1.3918 (257)
SAP value		80.5842
SAP rating (Section 12)		81 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3131.4971	0.2160	676.4034 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1888.8133	0.2160	407.9837 (264)
Space and water heating			1084.3871 (265)
Pumps and fans	175.9486	0.5190	91.3173 (267)
Energy for lighting	303.3599	0.5190	157.4438 (268)
Energy saving/generation technologies			
PV Unit	-725.4700	0.5190	-376.5189 (269)
Total kg/year			956.6292 (272)
CO2 emissions per m2			15.1800 (273)
EI value			88.1318
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

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

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Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8864 = 3.926$, stars = 4
Water heating environmental impact	$0.216 / 0.8864 = 0.2437$, 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	63.0100 (1b)	x 2.6800 (2b)	= 168.8668 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.8668 (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					4.1900
Infiltration rate					0.2095 (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) =				0.1938 (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	0.2277	0.2132	0.2132	0.1938	0.1986	0.1889	0.1889	0.1841	0.1841	0.1986	0.1938	0.1986 (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)			9.0200	1.1450	10.3282		(27)
Heat Loss Floor 1			63.0100	0.1200	7.5612		(28a)
Ground Floor Walls	74.7500	9.0200	65.7300	0.2700	17.7471		(29a)
Wall to Corridor	21.4400	2.1200	19.3200	0.2041	3.9429		(29a)
Total net area of external elements Aum(A, m2)			159.2000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.9114		(33)
Party Wall 1			9.2500	0.0000	0.0000		(32)
Party Ceilings 1			62.8600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.3046 (36)
Total fabric heat loss							(33) + (36) = 54.2160 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630	27.8630 (38)
Heat transfer coeff	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790	82.0790 (39)
Average = Sum(39)m / 12 =												82.0790 (39)
HLP	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026	1.3026 (40)
HLP (average)												1.3026 (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												2.0653 (42)
Average daily hot water use (litres/day)												83.2517 (43)
Daily hot water use	91.5769	88.2468	84.9167	81.5867	78.2566	74.9265	74.9265	78.2566	81.5867	84.9167	88.2468	91.5769 (44)
Energy conte	135.8059	118.7767	122.5669	106.8568	102.5316	88.4770	81.9869	94.0812	95.2048	110.9521	121.1129	131.5207 (45)
Energy content (annual)												Total = Sum(45)m = 1309.8734 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3709	17.8165	18.3850	16.0285	15.3797	13.2715	12.2980	14.1122	14.2807	16.6428	18.1669	19.7281 (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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	31.1864	28.1541	31.1478	30.1173	31.1025	30.0777	31.0668	31.0900	30.0993	31.1291	30.1548	(61)
Total heat required for water heating calculated for each month	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	(64)
Heat gains from water heating, kWh/month	52.9520	46.5318	48.5404	43.0592	41.8674	36.9380	35.0274	39.0545	39.1804	44.6738	47.8087	(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	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	123.9201	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	42.9437	38.1422	31.0194	23.4837	17.5543	14.8201	16.0136	20.8151	27.9380	35.4737	41.4031	44.1373	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	269.3573	272.1524	265.1089	250.1141	231.1858	213.3958	201.5111	198.7160	205.7595	220.7544	239.6827	257.4726	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	49.4573	(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)	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	-82.6134	(71)
Water heating gains (Table 5)	71.1721	69.2437	65.2425	59.8045	56.2734	51.3028	47.0798	52.4926	54.4173	60.0455	66.4010	69.2545	(72)
Total internal gains	477.2372	473.3024	455.1348	427.1662	398.7775	373.2828	358.3685	365.7878	381.8788	410.0376	441.2507	464.6284	(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				4.4600	14.6130	0.6300	0.7000	0.7700		19.9181 (75)
Northwest				4.5600	14.6130	0.6300	0.7000	0.7700		20.3647 (81)
Solar gains	40.2827	70.2862	129.4551	212.7248	267.3648	314.2465	282.9108	236.7205	165.0474	92.9091 50.6390 31.0635 (83)
Total gains	517.5199	543.5886	584.5900	639.8910	666.1423	687.5293	641.2793	602.5082	546.9263	502.9467 491.8897 495.6920 (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	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108	53.3108		
alpha	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541	4.5541		
util living area	0.9898	0.9864	0.9728	0.9267	0.8087	0.5823	0.4175	0.4303	0.7423	0.9349	0.9808	0.9912	(86)	
MIT	19.9098	19.9921	20.2297	20.5625	20.8409	20.9735	20.9955	20.9951	20.9222	20.6225	20.2237	19.8913	(87)	
Th 2	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	19.8388	(88)	
util rest of house	0.9862	0.9815	0.9626	0.8979	0.7365	0.4621	0.2732	0.2772	0.6271	0.9010	0.9725	0.9880	(89)	
MIT 2	18.8841	18.9653	19.1981	19.5128	19.7481	19.8307	19.8383	19.8383	19.8078	19.5748	19.1948	18.8661	(90)	
Living area fraction	19.3005	19.3821	19.6169	19.9390	20.1918	20.2946	20.3081	20.3079	20.2602	20.0001	19.6125	19.2823	(92)	
Temperature adjustment	19.3005	19.3821	19.6169	19.9390	20.1918	20.2946	20.3081	20.3079	20.2602	20.0001	19.6125	19.2823	(93)	
adjusted MIT	19.3005	19.3821	19.6169	19.9390	20.1918	20.2946	20.3081	20.3079	20.2602	20.0001	19.6125	19.2823	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	509.2573	532.2053	561.3270	576.4310	506.7141	351.3597	213.1004	204.8233	367.8888	456.0259	477.3585	488.7475	(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	1124.5230	1098.3929	986.3356	807.5719	582.0861	360.7065	214.0667	205.8442	398.9202	648.4358	903.8927	1114.8210	(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	457.7577	380.4780	316.2064	166.4214	56.0768	0.0000	0.0000	0.0000	0.0000	143.1530	307.1046	465.7987	(98)	
Space heating												2292.9967	(98)	
Space heating per m2												36.3910	(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													2528.1110 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	457.7577	380.4780	316.2064	166.4214	56.0768	0.0000	0.0000	0.0000	0.0000	143.1530	307.1046	465.7987	(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)	504.6943	419.4907	348.6289	183.4856	61.8266	0.0000	0.0000	0.0000	0.0000	157.8313	338.5939	513.5598	(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	166.9922	146.9307	153.7147	136.9741	133.6342	118.5547	113.0537	125.1712	125.3041	142.0812	151.2676	162.6996	(64)
Efficiency of water heater (217)m	89.6805	89.6380	89.4555	88.9913	88.0619	87.0000	87.0000	87.0000	87.0000	88.8184	89.4447	89.7123	(216)
Fuel for water heating, kWh/month	186.2079	163.9157	171.8336	153.9185	151.7503	136.2697	129.9468	143.8749	144.0277	159.9681	169.1187	181.3571	(219)
Water heating fuel used													1892.1892 (219)
Annual totals kWh/year													
Space heating fuel - main system													2528.1110 (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)													100.9486 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													175.9486 (231)
Electricity for lighting (calculated in Appendix L)													303.3599 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													4899.6087 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2528.1110	3.6300	91.7704 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1892.1892	3.6300	68.6865 (247)
Mechanical ventilation fans	100.9486	19.4400	19.6244 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	303.3599	19.4400	58.9732 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	19.4400	0.0000 (252)
Total energy cost			348.6345 (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	2528.1110	0.2160	546.0720 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1892.1892	0.2160	408.7129 (264)
Space and water heating			954.7848 (265)
Pumps and fans	175.9486	0.5190	91.3173 (267)
Energy for lighting	303.3599	0.5190	157.4438 (268)
Energy saving/generation technologies			
PV Unit	-725.4700	0.5190	-376.5189 (269)
Total kg/year			827.0270 (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	2528.1110	1.2200	3084.2954 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1892.1892	1.2200	2308.4708 (264)
Space and water heating			5392.7663 (265)
Pumps and fans	175.9486	3.0700	540.1621 (267)
Energy for lighting	303.3599	3.0700	931.3150 (268)
Energy saving/generation technologies			
PV Unit	-725.4700	3.0700	-2227.1929 (269)
Primary energy kWh/year			4637.0504 (272)
Primary energy kWh/m2/year			73.5923 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 81
Current environmental impact rating: B 88

(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 81
Potential environmental impact rating: B 88

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	£93	£93	£0
Mains gas	£255	£255	£0
Space heating	£221	£221	£0
Water heating	£69	£69	£0
Lighting	£59	£59	£0
Total cost of fuels	£348	£348	£0
Total cost of uses	£349	£349	£0
Delivered energy	78 kWh/m²	78 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	13 kg/m²	13 kg/m²	0 kg/m²
Primary energy	74 kWh/m²	74 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 93	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	10 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	17.57	TER	22.24
Environmental	88 B	% DER<TER	20.99		
CO ₂ Emissions (t/year)	0.83	DFEE	61.71	TFEE	65.13
General Requirements Compliance	Pass	% DFEE<TFEE	5.24		

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 93	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	10 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	17.57	TER	22.24
Environmental	88 B	% DER<TER	20.99		
CO ₂ Emissions (t/year)	0.83	DFEE	61.71	TFEE	65.13
General Requirements Compliance	Pass	% DFEE<TFEE	5.24		

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

Wall Wall to Corridor

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00		
Layer 2	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 3	Hemelite standard solid *7.3N						
	Main construction	100	0.4700	0.2128	93.43		
	Main construction	100	0.8803	0.1136	6.57		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 5	Hemelite standard solid *7.3N						
	Main construction	100	0.4700	0.2128	93.43	1450	1000
	Main construction	100	0.8803	0.1136	6.57	1450	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 6	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 7	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

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

U-VALUE CALCULATOR REPORT

Unheated space: None

Total thickness: 355 mm

U-value: 0.25 W/m² K

Kappa: 113.50 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Flat 93	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	10 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	17.57	TER	22.24
Environmental	88 B	% DER<TER	20.99		
CO ₂ Emissions (t/year)	0.83	DFEE	61.71	TFEE	65.13
General Requirements Compliance	Pass	% DFEE<TFEE	5.24		

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

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

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

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Flat 93				Issued on Date	02/08/2022	
Assessment Reference	As Built		Prop Type Ref	J (HA-AR)			
Property	10 Haines Crescent, WEST END, SO30 3LG						
SAP Rating			81 B	DER	17.57	TER	22.24
Environmental			88 B	% DER<TER	20.99		
CO ₂ Emissions (t/year)			0.83	DFEE	61.71	TFEE	65.13
General Requirements Compliance			Pass	% DFEE<TFEE	5.24		
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
		35.89 m	63.01 m ²	2.68 m

7.0 Living Area	25.58	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	74.75	65.73
Wall to Corridor	Cavity Wall	0.25	21.44	19.32

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	9.25

10.1 Party Ceilings				
Description	Construction			Area (m ²)

11.0 Heat Loss Floors				
Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Heat Loss Floor 1	Ground Floor - Solid		0.12	63.01

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					4.46	
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	18.30	0.050	No
Table K1 - Approved	E5 Ground floor (normal)	32.44	0.160	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	32.44	0.070	No
Table K1 - Approved	E16 Corner (normal)	10.72	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	5.36	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	2.68	0.060	No
Table K1 - Default	E25 Staggered party wall between dwellings	2.68	0.120	No
Table K1 - Default	P1 Party wall - Ground floor	3.45	0.160	No
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.45	0.000	No

Y-value	0.077	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	5.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	Yes	
	4.19	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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Manufacturer SFP	0.35
Duct Type	Rigid
Wet Rooms	1

20.0 Fans, Open Fireplaces, Flues

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

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
	No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	901	
29.0 Hot Water Cylinder	None	
32.0 Photovoltaic Unit	More Dwellings, One Block	
Apportioned	725.47	kWh/Year

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

BLOCK COMPLIANCE

Calculation Type: New Build (As Built)

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

Block Compliance Report - DER

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

Block Compliance Report - DFEE

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