



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 8 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 92	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Property	8 Haines Crescent, WEST END, SO30 3LG		
SAP Rating	81 B	DER	17.06
Environmental	88 B	% DER<TER	20.92
CO ₂ Emissions (t/year)	0.90	DFEE	61.49
General Requirements Compliance	Pass	% DFEE<TFEE	4.21
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
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)	21.57	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.06	kgCO ₂ /m ²	Pass
	-4.51 (-20.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	64.19	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	61.49	kWh/m ² /yr	
	-2.7 (-4.2%)	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
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.10 (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 South West

4.32 m², No overhang

Air change rate

3.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Roof U-value

0.10 W/m²K

Floor U-value

0.12 W/m²K

Door U-value

1.10 W/m²K

Photovoltaic array

820.46 kWh/Year

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THERMAL BRIDGING

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SAP Rating	81 B	DER	17.06	TER	21.57
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CO ₂ Emissions (t/year)	0.90	DFEE	61.49	TFEE	64.19
General Requirements Compliance	Pass	% DFEE<TFEE	4.21		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	7.58	2.27	
External wall	E3 Sill	Table K1 - Approved	0.040	6.57	0.26	
External wall	E4 Jamb	Table K1 - Approved	0.050	17.40	0.87	
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	41.56	6.65	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	34.96	2.45	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	2.97	0.18	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	0.240	2.79	0.67	
External wall	E12 Gable (insulation at ceiling level)	Table K1 - Approved	0.240	5.76	1.38	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	18.79	1.69	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	8.04	-0.72	

Total: **15.70** W/mK:
Y-Value: **0.082** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	88 B	% DER<TER	20.92			
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General Requirements Compliance	Pass	% DFEE<TFEE	4.21			
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Ground-floor flat, total floor area 71 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) 21.57 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.06 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 64.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 61.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.10 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system
Specific fan power: 0.35
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average
Windows facing North East: 4.46 m², No overhang
Windows facing South West: 4.32 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: None

10 Key features

Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 820.46 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	71.2600 (1b)	x 2.6800 (2b)	= 190.9768 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 190.9768 (5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							4.1000					
Infiltration rate							0.2050	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1743 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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												
	0.2222	0.2178	0.2135	0.1917	0.1873	0.1655	0.1655	0.1612	0.1743	0.1873	0.1960	0.2047 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.7800	1.1450	10.0534		(27)
Heat Loss Floor 1			71.2600	0.1200	8.5512		(28a)
Ground Floor Walls	89.0200	10.9000	78.1200	0.2700	21.0924		(29a)
Wall to Corridor	17.9000		17.9000	0.2041	3.6531		(29a)
Wall to Corridor	4.4600		4.4600	0.2320	1.0348		(29a)
Pitched Roof	8.8000		8.8000	0.1000	0.8800		(30)
Total net area of external elements Aum(A, m ²)			191.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	47.5969	(33)
Party Ceilings 1			63.1000				(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)							15.7013 (36)
Total fabric heat loss							(33) + (36) = 63.2982 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112 (38)
Heat transfer coeff	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094 (39)
Average = Sum(39)m / 12 =												94.8094 (39)
HLP	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305 (40)
HLP (average)												1.3305 (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												2.2763 (42)
Average daily hot water use (litres/day)												88.2626 (43)
Daily hot water use	Jan 97.0889	Feb 93.5584	Mar 90.0279	Apr 86.4974	May 82.9669	Jun 79.4364	Jul 79.4364	Aug 82.9669	Sep 86.4974	Oct 90.0279	Nov 93.5584	Dec 97.0889 (44)
Energy conte	143.9800	125.9259	129.9442	113.2885	108.7030	93.8025	86.9218	99.7440	100.9352	117.6303	128.4027	139.4370 (45)
Energy content (annual)												Total = Sum(45)m = 1388.7151 (45)
Distribution loss (46)m = 0.15 x (45)m												

	21.5970	18.8889	19.4916	16.9933	16.3055	14.0704	13.0383	14.9616	15.1403	17.6445	19.2604	20.9155 (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	31.2157	28.1788	31.1724	30.1379	31.1214	30.0933	31.0813	31.1073	30.1176	31.1513	30.1799	31.2073 (61)
Total heat required for water heating calculated for each month												
Solar input	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443 (62)
	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	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443 (64)
								Total per year (kWh/year) = Sum(64)m =				1755.4793 (64)
Heat gains from water heating, kWh/month												
	55.6773	48.9150	50.9995	45.2029	43.9241	38.7126	36.6718	40.9417	41.0904	46.8999	50.2389	54.1646 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.6970	17.4947	14.2276	10.7712	8.0516	6.7975	7.3450	9.5472	12.8143	16.2707	18.9903	20.2444 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.2198	202.2974	197.0618	185.9158	171.8459	158.6223	149.7880	147.7104	152.9460	164.0920	178.1619	191.3855 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816 (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)	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529 (71)
Water heating gains (Table 5)	74.8351	72.7902	68.5478	62.7818	59.0378	53.7675	49.2901	55.0292	57.0700	63.0375	69.7762	72.8019 (72)
Total internal gains	354.8966	352.7272	339.9820	319.6136	299.0802	279.3321	266.5679	272.4316	282.9751	303.5450	327.0732	344.5767 (73)

[Jan				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
Northeast				4.4600	11.2829	0.6300		0.7000	0.7700		15.3790 (75)	
Southwest				4.3200	36.7938	0.6300		0.7000	0.7700		48.5770 (79)	
Solar gains	63.9560	114.0491	169.6154	232.9047	281.6314	288.7258	274.5626	236.8143	191.3128	129.7069	77.5348	54.1311 (83)
Total gains	418.8526	466.7762	509.5975	552.5183	580.7115	568.0580	541.1304	509.2459	474.2878	433.2520	404.6080	398.7078 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nli,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954
alpha	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797
util living area	0.9981	0.9966	0.9926	0.9800	0.9415	0.8434	0.6984	0.7491	0.9214	0.9858	0.9965	0.9985 (86)
MIT	19.5131	19.6458	19.8913	20.2271	20.5726	20.8371	20.9500	20.9303	20.7229	20.2868	19.8329	19.4756 (87)
Th 2	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170 (88)
util rest of house	0.9974	0.9953	0.9897	0.9711	0.9116	0.7568	0.5439	0.6029	0.8675	0.9778	0.9950	0.9980 (89)
MIT 2	18.4729	18.6053	18.8495	19.1809	19.5105	19.7345	19.8034	19.7954	19.6504	19.2425	18.7923	18.4355 (90)
Living area fraction												0.3448 (91)
MIT	18.8316	18.9640	19.2087	19.5417	19.8767	20.1147	20.1987	20.1867	20.0202	19.6026	19.1511	18.7941 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8316	18.9640	19.2087	19.5417	19.8767	20.1147	20.1987	20.1867	20.0202	19.6026	19.1511	18.7941 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9966	0.9941	0.9877	0.9684	0.9134	0.7821	0.5984	0.6540	0.8790	0.9758	0.9938	0.9973 (94)
Useful gains	417.4439	464.0138	503.3142	535.0332	530.4496	444.2597	323.8384	333.0699	416.9216	422.7665	402.1018	397.6293 (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	1377.7305	1333.4028	1204.9057	1008.9283	775.2297	522.8412	341.1951	359.0143	561.2918	853.5301	1142.5553	1383.6563 (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	714.4533	584.2294	521.9840	341.2044	182.1164	0.0000	0.0000	0.0000	0.0000	320.4881	533.1265	733.6041 (98)
Space heating												3931.2062 (98)
Space heating per m2												55.1671 (99)
										(98) / (4) =		

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

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												4334.2957 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	714.4533	584.2294	521.9840	341.2044	182.1164	0.0000	0.0000	0.0000	0.0000	320.4881	533.1265	733.6041 (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)	787.7103	644.1338	575.5061	376.1901	200.7898	0.0000	0.0000	0.0000	0.0000	353.3496	587.7911	808.8248 (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	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443 (64)
Efficiency of water heater (217)m	89.9467	89.9020	89.7992	89.5726	89.0551	87.0000	87.0000	87.0000	87.0000	89.4933	89.8242	87.0000 (216)
Fuel for water heating, kWh/month	194.7773	171.4141	179.4187	160.1231	157.0090	142.4089	135.6357	150.4038	150.6354	166.2489	176.5478	189.6514 (219)
Water heating fuel used												1974.2740 (219)
Annual totals kWh/year												
Space heating fuel - main system												4334.2957 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4900)												
mechanical ventilation fans (SFP = 0.4900)												114.1659 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												189.1659 (231)
Electricity for lighting (calculated in Appendix L)												347.8545 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												6845.5901 (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	4334.2957	0.2160	936.2079 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	
Water heating (other fuel)	1974.2740	0.2160	426.4432 (264)	
Space and water heating			1362.6510 (265)	
Pumps and fans	189.1659	0.5190	98.1771 (267)	
Energy for lighting	347.8545	0.5190	180.5365 (268)	
Energy saving/generation technologies				
PV Unit	-820.4600	0.5190	-425.8187 (269)	
Total CO2, kg/year			1215.5459 (272)	
Dwelling Carbon Dioxide Emission Rate (DER)			17.0600 (273)	

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

DER			17.0600 ZC1
Total Floor Area		TFA	71.2600
Assumed number of occupants		N	2.2763
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.6497 ZC2
CO2 emissions from cooking, equation (L16)			2.4366 ZC3
Total CO2 emissions			36.1463 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			36.1463 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.2600 (1b)	x 2.6800 (2b)	= 190.9768 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 190.9768 (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					3 * 10 = 30.0000 (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					30.0000 / (5) = 0.1571 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4071 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3460 (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	0.4412	0.4325	0.4239	0.3806	0.3720	0.3287	0.3287	0.3201	0.3460	0.3720	0.3893	0.4066 (22b)
	0.5973	0.5935	0.5898	0.5724	0.5692	0.5540	0.5540	0.5512	0.5599	0.5692	0.5758	0.5827 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			8.7800	1.3258	11.6402		(27)
Heat Loss Floor 1			71.2600	0.1300	9.2638		(28a)
Ground Floor Walls	89.0200	10.9000	78.1200	0.1800	14.0616		(29a)
Wall to Corridor	17.9000		17.9000	0.1800	3.2220		(29a)
Wall to Corridor	4.4600		4.4600	0.1800	0.8028		(29a)
Pitched Roof	8.8000		8.8000	0.1300	1.1440		(30)
Total net area of external elements Aum(A, m ²)			191.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	42.2544	(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)							12.8352 (36)
Total fabric heat loss						(33) + (36) =	55.0896 (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	37.6445	37.4064	37.1729	36.0764	35.8712	34.9162	34.9162	34.7394	35.2841	35.8712	36.2863	36.7202 (38)
Heat transfer coeff	92.7341	92.4959	92.2625	91.1660	90.9608	90.0058	90.0058	89.8289	90.3736	90.9608	91.3758	91.8097 (39)
Average = Sum(39)m / 12 =												91.1650 (39)
HLP	1.3013	1.2980	1.2947	1.2793	1.2765	1.2631	1.2631	1.2606	1.2682	1.2765	1.2823	1.2884 (40)
HLP (average)												1.2793 (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												2.2763 (42)
Average daily hot water use (litres/day)												88.2626 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.0889	93.5584	90.0279	86.4974	82.9669	79.4364	79.4364	82.9669	86.4974	90.0279	93.5584	97.0889 (44)
Energy content (annual)	143.9800	125.9259	129.9442	113.2885	108.7030	93.8025	86.9218	99.7440	100.9352	117.6303	128.4027	139.4370 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5970	18.8889	19.4916	16.9933	16.3055	14.0704	13.0383	14.9616	15.1403	17.6445	19.2604	20.9155 (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)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	49.4754	43.0625	45.8772	42.6562	42.2790	39.1741	40.4799	42.2790	42.6562	45.8772	46.1384	49.4754 (61)
Total heat required for water heating calculated for each month	193.4555	168.9884	175.8214	155.9448	150.9820	132.9766	127.4017	142.0230	143.5915	163.5075	174.5411	188.9124 (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	193.4555	168.9884	175.8214	155.9448	150.9820	132.9766	127.4017	142.0230	143.5915	163.5075	174.5411	188.9124 (64)
Heat gains from water heating, kWh/month	60.2422	52.6360	54.6758	48.3325	46.7135	40.9828	39.0215	43.7346	44.2250	50.5814	54.2285	58.7317 (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	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.6970	17.4947	14.2276	10.7712	8.0516	6.7975	7.3450	9.5472	12.8143	16.2707	18.9903	20.2444 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.2198	202.2974	197.0618	185.9158	171.8459	158.6223	149.7880	147.7104	152.9460	164.0920	178.1619	191.3855 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816 (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)	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529 (71)
Water heating gains (Table 5)	80.9707	78.3273	73.4889	67.1285	62.7870	56.9206	52.4482	58.7831	61.4237	67.9857	75.3173	78.9404 (72)
Total internal gains	361.0323	358.2643	344.9232	323.9603	302.8293	282.4852	269.7260	276.1856	287.3288	308.4933	332.6143	350.7152 (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
Southwest				4.3200	36.7938			0.6300	0.7000	0.7700		48.5770 (75)
Solar gains	63.9560	114.0491	169.6154	232.9047	281.6314	288.7258	274.5626	236.8143	191.3128	129.7069	77.5348	54.1311 (83)
Total gains	424.9883	472.3133	514.5386	556.8650	584.4607	571.2110	544.2886	512.9999	478.6415	438.2002	410.1492	404.8462 (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	53.3635	53.5009	53.6362	54.2814	54.4038	54.9810	54.9810	55.0893	54.7572	54.4038	54.1567	53.9007
alpha	4.5576	4.5667	4.5757	4.6188	4.6269	4.6654	4.6654	4.6726	4.6505	4.6269	4.6104	4.5934
util living area	0.9980	0.9964	0.9922	0.9785	0.9362	0.8269	0.6738	0.7248	0.9124	0.9845	0.9963	0.9984 (86)
MIT	19.5577	19.6928	19.9377	20.2812	20.6151	20.8661	20.9622	20.9465	20.7589	20.3371	19.8913	19.5368 (87)
Th 2	19.8398	19.8424	19.8450	19.8571	19.8593	19.8699	19.8699	19.8718	19.8658	19.8593	19.8547	19.8499 (88)
util rest of house	0.9973	0.9951	0.9892	0.9691	0.9048	0.7395	0.5262	0.5832	0.8561	0.9761	0.9947	0.9979 (89)
MIT 2	17.9289	18.1280	18.4866	18.9909	19.4568	19.7717	19.8549	19.8478	19.6555	19.0772	18.4270	17.9053 (90)
Living area fraction	18.4905	18.6675	18.9869	19.4358	19.8562	20.1490	20.2367	20.2266	20.0359	19.5116	18.9319	18.4678 (92)
MIT	18.4905	18.6675	18.9869	19.4358	19.8562	20.1490	20.2367	20.2266	20.0359	19.5116	18.9319	18.4678 (91)
Temperature adjustment												0.0000
adjusted MIT	18.4905	18.6675	18.9869	19.4358	19.8562	20.1490	20.2367	20.2266	20.0359	19.5116	18.9319	18.4678 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	423.3184	469.0953	507.3354	537.0705	528.7733	436.4738	314.4328	324.2681	414.7376	426.1301	407.2187	403.5730 (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	1315.9428	1273.4387	1152.0728	960.5071	741.8903	499.4460	327.3221	343.7427	536.4516	810.6050	1081.1459	1309.9239 (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	664.1125	540.5188	479.6846	304.8743	158.5591	0.0000	0.0000	0.0000	0.0000	286.0494	485.2276	674.3251 (98)
Space heating												3593.3513 (98)
Space heating per m2										(98) / (4) =		50.4259 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 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 %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3847.2712 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	664.1125	540.5188	479.6846	304.8743	158.5591	0.0000	0.0000	0.0000	0.0000	286.0494	485.2276	674.3251 (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)	711.0412	578.7139	513.5809	326.4179	169.7635	0.0000	0.0000	0.0000	0.0000	306.2627	519.5156	721.9755 (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	193.4555	168.9884	175.8214	155.9448	150.9820	132.9766	127.4017	142.0230	143.5915	163.5075	174.5411	188.9124 (64)
Efficiency of water heater (217)m	87.9058	87.7706	87.4497	86.7093	85.1746	80.3000	80.3000	80.3000	80.3000	86.4454	87.4889	80.3000 (216)
Fuel for water heating, kWh/month	220.0714	192.5341	201.0543	179.8479	177.2619	165.5997	158.6571	176.8655	178.8188	189.1454	199.5009	214.7261 (219)
Water heating fuel used												2254.0831 (219)
Annual totals kWh/year												
Space heating fuel - main system												3847.2712 (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)												347.8545 (232)
Total delivered energy for all uses												6524.2088 (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	3847.2712	0.2160	831.0106 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2254.0831	0.2160	486.8819 (264)
Space and water heating			1317.8925 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	347.8545	0.5190	180.5365 (268)
Total CO2, kg/m2/year			1537.3540 (272)
Emissions per m2 for space and water heating			18.4941 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5335 (272b)
Emissions per m2 for pumps and fans			0.5462 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.4941 * 1.00) + 2.5335 + 0.5462, rounded to 2 d.p.			21.5700 (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	71.2600 (1b)	x 2.6800 (2b)	= 190.9768 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 190.9768 (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					3 * 10 = 30.0000 (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					30.0000 / (5) = 0.1571 (8)
Measured/design AP50					Yes
Infiltration rate					4.1000
Number of sides sheltered					0.3621 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3078 (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	0.3924	0.3847	0.3770	0.3386	0.3309	0.2924	0.2924	0.2847	0.3078	0.3309	0.3462	0.3616 (22b)
	0.5770	0.5740	0.5711	0.5573	0.5547	0.5427	0.5427	0.5405	0.5474	0.5547	0.5599	0.5654 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.7800	1.1450	10.0534		(27)
Heat Loss Floor 1			71.2600	0.1200	8.5512		(28a)
Ground Floor Walls	89.0200	10.9000	78.1200	0.2700	21.0924		(29a)
Wall to Corridor	17.9000		17.9000	0.2041	3.6531		(29a)
Wall to Corridor	4.4600		4.4600	0.2320	1.0348		(29a)
Pitched Roof	8.8000		8.8000	0.1000	0.8800		(30)
Total net area of external elements Aum(A, m ²)			191.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	47.5969	(33)
Party Ceilings 1			63.1000				(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)							15.7013 (36)
Total fabric heat loss						(33) + (36) =	63.2982 (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	36.3635	36.1751	35.9904	35.1229	34.9606	34.2050	34.2050	34.0651	34.4961	34.9606	35.2889	35.6322 (38)
Heat transfer coeff	99.6617	99.4733	99.2886	98.4211	98.2588	97.5032	97.5032	97.3633	97.7943	98.2588	98.5871	98.9304 (39)
Average = Sum(39)m / 12 =												98.4203 (39)
HLP	1.3986	1.3959	1.3933	1.3812	1.3789	1.3683	1.3683	1.3663	1.3724	1.3789	1.3835	1.3883 (40)
HLP (average)												1.3811 (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												2.2763 (42)
Average daily hot water use (litres/day)												88.2626 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.0889	93.5584	90.0279	86.4974	82.9669	79.4364	79.4364	82.9669	86.4974	90.0279	93.5584	97.0889 (44)
Energy conte	143.9800	125.9259	129.9442	113.2885	108.7030	93.8025	86.9218	99.7440	100.9352	117.6303	128.4027	139.4370 (45)
Energy content (annual)												Total = Sum(45)m = 1388.7151 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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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	0.0000 (56)
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 (57)
Heat gains from water heating, kWh/month	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)
	30.5958	26.7592	27.6131	24.0738	23.0994	19.9330	18.4709	21.1956	21.4487	24.9964	27.2856	29.6304 (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	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.6970	17.4947	14.2276	10.7712	8.0516	6.7975	7.3450	9.5472	12.8143	16.2707	18.9903	20.2444	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.2198	202.2974	197.0618	185.9158	171.8459	158.6223	149.7880	147.7104	152.9460	164.0920	178.1619	191.3855	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	(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)	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	(71)
Water heating gains (Table 5)	41.1233	39.8203	37.1144	33.4358	31.0476	27.6848	24.8264	28.4887	29.7899	33.5974	37.8966	39.8258	(72)
Total internal gains	318.1849	316.7572	305.5487	287.2677	268.0899	250.2493	239.1043	242.8912	252.6950	271.1049	292.1936	308.6005	(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	
Southwest					4.3200	36.7938	0.6300		0.7000		0.7700	48.5770	
													(75)
Solar gains	63.9560	114.0491	169.6154	232.9047	281.6314	288.7258	274.5626	236.8143	191.3128	129.7069	77.5348	54.1311	
Total gains	382.1409	430.8063	475.1641	520.1724	549.7213	538.9752	513.6668	479.7055	444.0078	400.8118	369.7285	362.7316	
													(83)
													(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	49.6541	49.7482	49.8407	50.2800	50.3630	50.7533	50.7533	50.8262	50.6023	50.3630	50.1953	50.0211		
alpha	4.3103	4.3165	4.3227	4.3520	4.3575	4.3836	4.3836	4.3884	4.3735	4.3575	4.3464	4.3347		
util living area	0.9986	0.9975	0.9944	0.9845	0.9534	0.8686	0.7345	0.7854	0.9387	0.9896	0.9975	0.9989	(86)	
MIT	19.3827	19.5219	19.7794	20.1415	20.5070	20.8024	20.9344	20.9098	20.6732	20.2090	19.7339	19.3584	(87)	
Th 2	19.7644	19.7665	19.7685	19.7778	19.7796	19.7877	19.7877	19.7893	19.7846	19.7796	19.7760	19.7723	(88)	
util rest of house	0.9982	0.9965	0.9922	0.9773	0.9279	0.7875	0.5768	0.6399	0.8926	0.9836	0.9965	0.9986	(89)	
MIT 2	18.3021	18.4426	18.7009	19.0668	19.4205	19.6846	19.7693	19.7601	19.5824	19.1372	18.6619	18.2839	(90)	
Living area fraction														
MIT	18.6747	18.8147	19.0727	19.4373	19.7951	20.0700	20.1710	20.1565	19.9585	19.5067	19.0315	18.6544	(92)	
Temperature adjustment														
adjusted MIT	18.6747	18.8147	19.0727	19.4373	19.7951	20.0700	20.1710	20.1565	19.9585	19.5067	19.0315	18.6544	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9975	0.9955	0.9904	0.9746	0.9284	0.8099	0.6325	0.6907	0.9011	0.9817	0.9955	0.9980	(94)
Ext temp.	381.1986	428.8780	470.6140	506.9736	510.3356	436.5420	324.9189	331.3436	400.0764	393.4706	368.0678	362.0230	(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	1432.6062	1384.1418	1248.3293	1037.0959	795.4175	533.3445	348.1875	365.7467	572.9299	875.1632	1176.2956	1429.9762	(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	782.2472	641.9373	578.6202	381.6881	212.1010	0.0000	0.0000	0.0000	0.0000	358.3793	581.9240	794.5572	(98)
Space heating per m2												4331.4543	(98)
												60.7838	(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	916.5304	721.5239	739.9612	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7020	0.7920	0.7554	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	643.4254	571.4159	558.9336	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	715.3606	684.1310	646.0767	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	51.7934	83.8600	64.8345	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												200.4879 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	12.9483	20.9650	16.2086	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												50.1220 (107)
Space cooling per m2												0.7034 (108)
Energy for space heating												60.7838 (99)
Energy for space cooling												0.7034 (108)
Total												61.4872 (109)
Dwelling Fabric Energy Efficiency (DFEE)												61.5 (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	71.2600 (1b)	x 2.6800 (2b)	= 190.9768 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 190.9768 (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					3 * 10 = 30.0000 (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					30.0000 / (5) = 0.1571 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4071 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3460 (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	0.4412	0.4325	0.4239	0.3806	0.3720	0.3287	0.3287	0.3201	0.3460	0.3720	0.3893	0.4066 (22b)
	0.5973	0.5935	0.5898	0.5724	0.5692	0.5540	0.5540	0.5512	0.5599	0.5692	0.5758	0.5827 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			8.7800	1.3258	11.6402		(27)
Heat Loss Floor 1			71.2600	0.1300	9.2638		(28a)
Ground Floor Walls	89.0200	10.9000	78.1200	0.1800	14.0616		(29a)
Wall to Corridor	17.9000		17.9000	0.1800	3.2220		(29a)
Wall to Corridor	4.4600		4.4600	0.1800	0.8028		(29a)
Pitched Roof	8.8000		8.8000	0.1300	1.1440		(30)
Total net area of external elements Aum(A, m ²)			191.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	42.2544	(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)							12.8352 (36)
Total fabric heat loss						(33) + (36) =	55.0896 (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	37.6445	37.4064	37.1729	36.0764	35.8712	34.9162	34.9162	34.7394	35.2841	35.8712	36.2863	36.7202 (38)
Heat transfer coeff	92.7341	92.4959	92.2625	91.1660	90.9608	90.0058	90.0058	89.8289	90.3736	90.9608	91.3758	91.8097 (39)
Average = Sum(39)m / 12 =												91.1650 (39)
HLP	1.3013	1.2980	1.2947	1.2793	1.2765	1.2631	1.2631	1.2606	1.2682	1.2765	1.2823	1.2884 (40)
HLP (average)												1.2793 (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												2.2763 (42)
Average daily hot water use (litres/day)												88.2626 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.0889	93.5584	90.0279	86.4974	82.9669	79.4364	79.4364	82.9669	86.4974	90.0279	93.5584	97.0889 (44)
Energy content (annual)	143.9800	125.9259	129.9442	113.2885	108.7030	93.8025	86.9218	99.7440	100.9352	117.6303	128.4027	139.4370 (45)
Distribution loss (46)m = 0.15 x (45)m												1388.7151 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.5958	26.7592	27.6131	24.0738	23.0994	19.9330	18.4709	21.1956	21.4487	24.9964	27.2856	29.6304 (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	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	113.8161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.6970	17.4947	14.2276	10.7712	8.0516	6.7975	7.3450	9.5472	12.8143	16.2707	18.9903	20.2444	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.2198	202.2974	197.0618	185.9158	171.8459	158.6223	149.7880	147.7104	152.9460	164.0920	178.1619	191.3855	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	34.3816	(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)	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	(71)
Water heating gains (Table 5)	41.1233	39.8203	37.1144	33.4358	31.0476	27.6848	24.8264	28.4887	29.7899	33.5974	37.8966	39.8258	(72)
Total internal gains	318.1849	316.7572	305.5487	287.2677	268.0899	250.2493	239.1043	242.8912	252.6950	271.1049	292.1936	308.6005	(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)	
Southwest					4.3200	36.7938	0.6300	0.7000			0.7700	48.5770 (79)	

Solar gains	63.9560	114.0491	169.6154	232.9047	281.6314	288.7258	274.5626	236.8143	191.3128	129.7069	77.5348	54.1311 (83)	
Total gains	382.1409	430.8063	475.1641	520.1724	549.7213	538.9752	513.6668	479.7055	444.0078	400.8118	369.7285	362.7316 (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	53.3635	53.5009	53.6362	54.2814	54.4038	54.9810	54.9810	55.0893	54.7572	54.4038	54.1567	53.9007	
alpha	4.5576	4.5667	4.5757	4.6188	4.6269	4.6654	4.6654	4.6726	4.6505	4.6269	4.6104	4.5934	
util living area	0.9987	0.9975	0.9943	0.9833	0.9477	0.8497	0.7029	0.7573	0.9304	0.9891	0.9976	0.9990	(86)
MIT	19.5032	19.6404	19.8888	20.2383	20.5814	20.8475	20.9549	20.9355	20.7285	20.2920	19.8401	19.4830	(87)
Th 2	19.8398	19.8424	19.8450	19.8571	19.8593	19.8699	19.8699	19.8718	19.8658	19.8593	19.8547	19.8499	(88)
util rest of house	0.9983	0.9966	0.9921	0.9758	0.9207	0.7671	0.5539	0.6168	0.8820	0.9829	0.9966	0.9987	(89)
MIT 2	18.4808	18.6197	18.8693	19.2245	19.5552	19.7913	19.8573	19.8512	19.6988	19.2818	18.8290	18.4686	(90)
Living area fraction									fLA = Living area / (4) =			0.3448	(91)
MIT	18.8333	18.9716	19.2208	19.5740	19.9090	20.1555	20.2357	20.2250	20.0538	19.6301	19.1776	18.8183	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8333	18.9716	19.2208	19.5740	19.9090	20.1555	20.2357	20.2250	20.0538	19.6301	19.1776	18.8183	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9977	0.9957	0.9904	0.9734	0.9221	0.7913	0.6065	0.6660	0.8920	0.9812	0.9957	0.9982	(94)
Ext temp.	381.2637	428.9537	470.6205	506.3456	506.9253	426.4715	311.5221	319.4623	396.0545	393.2577	368.1363	362.0814	(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	1347.7326	1301.5671	1173.6532	973.1058	746.6999	500.0264	327.2348	343.5999	538.0666	821.3867	1103.6050	1342.1052	(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	(98)
Space heating per m2	719.0529	586.3962	523.0563	336.0674	178.3923	0.0000	0.0000	0.0000	0.0000	318.5280	529.5375	729.1377	(99)
												3920.1683	(98)
												55.0122	(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	846.0543	666.0428	682.6998	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7482	0.8343	0.8003	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	633.0264	555.7057	546.3430	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	715.3606	684.1310	646.0767	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	59.2806	95.5484	74.2019	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												229.0310	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	14.8202	23.8871	18.5505	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												57.2577 (107)
Space cooling per m2												0.8035 (108)
Energy for space heating												55.0122 (99)
Energy for space cooling												0.8035 (108)
Total												55.8157 (109)
Target Fabric Energy Efficiency (TFEE)												64.2 (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	71.2600 (1b)	x 2.6800 (2b)	= 190.9768 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 190.9768 (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					4.1000
Infiltration rate					0.2050 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1743 (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	0.2047	0.1917	0.1917	0.1743	0.1786	0.1699	0.1699	0.1655	0.1655	0.1786	0.1743	0.1786 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.7800	1.1450	10.0534		(27)
Heat Loss Floor 1			71.2600	0.1200	8.5512		(28a)
Ground Floor Walls	89.0200	10.9000	78.1200	0.2700	21.0924		(29a)
Wall to Corridor	17.9000		17.9000	0.2041	3.6531		(29a)
Wall to Corridor	4.4600		4.4600	0.2320	1.0348		(29a)
Pitched Roof	8.8000		8.8000	0.1000	0.8800		(30)
Total net area of external elements Aum(A, m ²)				191.4400			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.5969		(33)
Party Ceilings 1				63.1000			(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)							15.7013 (36)
Total fabric heat loss							(33) + (36) = 63.2982 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112 (38)
Heat transfer coeff	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094 (39)
Average = Sum(39)m / 12 =												94.8094 (39)
HLP	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305 (40)
HLP (average)												1.3305 (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												2.2763 (42)
Average daily hot water use (litres/day)												88.2626 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.0889	93.5584	90.0279	86.4974	82.9669	79.4364	79.4364	82.9669	86.4974	90.0279	93.5584	97.0889 (44)
Energy conte	143.9800	125.9259	129.9442	113.2885	108.7030	93.8025	86.9218	99.7440	100.9352	117.6303	128.4027	139.4370 (45)
Energy content (annual)											Total = Sum (45)m =	1388.7151 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	21.5970	18.8889	19.4916	16.9933	16.3055	14.0704	13.0383	14.9616	15.1403	17.6445	19.2604	20.9155 (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	31.2157	28.1788	31.1724	30.1379	31.1214	30.0933	31.0813	31.1073	30.1176	31.1513	30.1799	31.2073 (61)
Total heat required for water heating calculated for each month	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443 (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	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	55.6773	48.9150	50.9995	45.2029	43.9241	38.7126	36.6718	40.9417	41.0904	46.8999	50.2389	54.1646 (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	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.2424	43.7367	35.5691	26.9281	20.1290	16.9938	18.3624	23.8681	32.0357	40.6767	47.4758	50.6110 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	298.8355	301.9364	294.1221	277.4862	256.4865	236.7496	223.5642	220.4632	228.2776	244.9135	265.9132	285.6501 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343 (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)	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529 (71)
Water heating gains (Table 5)	74.8351	72.7902	68.5478	62.7818	59.0378	53.7675	49.2901	55.0292	57.0700	63.0375	69.7762	72.8019 (72)
Total internal gains	522.3736	517.9240	497.6996	466.6568	435.1140	406.9717	390.6774	398.8212	416.8440	448.0884	482.6259	508.5237 (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)
Southwest												4.3200	45.0642	0.6300	0.7000	0.7700	59.4959 (79)
Solar gains	79.4140	120.9815	184.3262	255.6675	291.7863	331.2126	302.5483	271.7690	218.2267	148.8017	96.0550	63.5709 (83)					
Total gains	601.7876	638.9056	682.0258	722.3243	726.9003	738.1843	693.2257	670.5902	635.0706	596.8901	578.6808	572.0945 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954
util living area	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797
	0.9888	0.9845	0.9705	0.9296	0.8295	0.6174	0.4442	0.4452	0.7377	0.9270	0.9783	0.9906 (86)
MIT	19.8963	19.9880	20.2235	20.5382	20.8137	20.9645	20.9937	20.9938	20.9203	20.6293	20.2223	19.8722 (87)
Th 2	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170 (88)
util rest of house	0.9849	0.9791	0.9594	0.9014	0.7597	0.4913	0.2887	0.2844	0.6207	0.8899	0.9691	0.9872 (89)
MIT 2	18.8534	18.9437	19.1740	19.4723	19.7091	19.8059	19.8163	19.8164	19.7857	19.5613	19.1756	18.8298 (90)
Living area fraction									fLA = Living area / (4) =			0.3448 (91)
MIT	19.2130	19.3037	19.5359	19.8398	20.0899	20.2054	20.2223	20.2224	20.1769	19.9295	19.5365	19.1892 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2130	19.3037	19.5359	19.8398	20.0899	20.2054	20.2223	20.2224	20.1769	19.9295	19.5365	19.1892 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9822	0.9760	0.9561	0.9020	0.7778	0.5349	0.3430	0.3406	0.6598	0.8942	0.9662	0.9848 (94)
Ext temp.	591.0956	623.5587	652.1175	651.5546	565.4014	394.8327	237.8014	228.4185	419.0079	533.7404	559.1260	563.3813 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1290.6366	1261.3195	1131.6331	923.4240	662.7117	408.1931	239.1366	229.6646	452.8940	742.3121	1036.8814	1278.9051 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
RHI space heating demand	520.4585	428.5753	356.7596	195.7460	72.3989	0.0000	0.0000	0.0000	0.0000	155.1774	343.9839	532.3497 (98)
												2605.4493 (98)
												2605 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.2600 (1b)	x 2.6800 (2b)	= 190.9768 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 190.9768 (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					4.1000
Infiltration rate					0.2050 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1743 (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	0.2222	0.2178	0.2135	0.1917	0.1873	0.1655	0.1655	0.1612	0.1743	0.1873	0.1960	0.2047 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.7800	1.1450	10.0534		(27)
Heat Loss Floor 1			71.2600	0.1200	8.5512		(28a)
Ground Floor Walls	89.0200	10.9000	78.1200	0.2700	21.0924		(29a)
Wall to Corridor	17.9000		17.9000	0.2041	3.6531		(29a)
Wall to Corridor	4.4600		4.4600	0.2320	1.0348		(29a)
Pitched Roof	8.8000		8.8000	0.1000	0.8800		(30)
Total net area of external elements Aum(A, m ²)				191.4400			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.5969		(33)
Party Ceilings 1				63.1000			(32b)

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

250.0000 (35)
15.7013 (36)
(33) + (36) = 63.2982 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112 (38)
Heat transfer coeff	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094 (39)
Average = Sum(39)m / 12 =												94.8094 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305 (40)
HLP (average)												1.3305 (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 2.2763 (42)
Average daily hot water use (litres/day) 88.2626 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.0889	93.5584	90.0279	86.4974	82.9669	79.4364	79.4364	82.9669	86.4974	90.0279	93.5584	97.0889 (44)
Energy conte	143.9800	125.9259	129.9442	113.2885	108.7030	93.8025	86.9218	99.7440	100.9352	117.6303	128.4027	139.4370 (45)
Energy content (annual)												Total = Sum(45)m = 1388.7151 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	21.5970	18.8889	19.4916	16.9933	16.3055	14.0704	13.0383	14.9616	15.1403	17.6445	19.2604	20.9155 (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	31.2157	28.1788	31.1724	30.1379	31.1214	30.0933	31.0813	31.1073	30.1176	31.1513	30.1799	31.2073 (61)
Total heat required for water heating calculated for each month	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443 (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	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443 (64)
Heat gains from water heating, kWh/month	55.6773	48.9150	50.9995	45.2029	43.9241	38.7126	36.6718	40.9417	41.0904	46.8999	50.2389	54.1646 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.2424	43.7367	35.5691	26.9281	20.1290	16.9938	18.3624	23.8681	32.0357	40.6767	47.4758	50.6110 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	298.8355	301.9364	294.1221	277.4862	256.4865	236.7496	223.5642	220.4632	228.2776	244.9135	265.9132	285.6501 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343 (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)	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529 (71)
Water heating gains (Table 5)	74.8351	72.7902	68.5478	62.7818	59.0378	53.7675	49.2901	55.0292	57.0700	63.0375	69.7762	72.8019 (72)
Total internal gains	522.3736	517.9240	497.6996	466.6568	435.1140	406.9717	390.6774	398.8212	416.8440	448.0884	482.6259	508.5237 (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)
Southwest				4.3200	36.7938		0.6300		0.7000		0.7700		48.5770 (79)

Solar gains	63.9560	114.0491	169.6154	232.9047	281.6314	288.7258	274.5626	236.8143	191.3128	129.7069	77.5348	54.1311 (83)	
Total gains	586.3297	631.9731	667.3150	699.5615	716.7454	695.6975	665.2399	635.6355	608.1567	577.7953	560.1607	562.6547 (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	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954
Feb	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797
Mar	0.9926	0.9886	0.9794	0.9544	0.8910	0.7576	0.5957	0.6405	0.8460	0.9601	0.9874	0.9939 (86)
Apr	19.7223	19.8495	20.0798	20.3881	20.6898	20.8983	20.9734	20.9630	20.8218	20.4497	20.0242	19.6811 (87)
May	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170 (88)
Jun	0.9902	0.9848	0.9721	0.9365	0.8453	0.6583	0.4508	0.4972	0.7676	0.9408	0.9825	0.9918 (89)
Jul	18.6807	18.8066	19.0337	19.3323	19.6082	19.7702	19.8105	19.8069	19.7211	19.3956	18.9808	18.6398 (90)
Aug	19.0398	19.1662	19.3944	19.6964	19.9811	20.1592	20.2115	20.2055	20.1006	19.7590	19.3406	18.9989 (92)
Sep	19.0398	19.1662	19.3944	19.6964	19.9811	20.1592	20.2115	20.2055	20.1006	19.7590	19.3406	18.9989 (93)
Oct												
Nov												
Dec												

8. Space heating requirement

Utilisation	0.9880	0.9821	0.9687	0.9343	0.8527	0.6898	0.5016	0.5473	0.7892	0.9396	0.9798	0.9899 (94)
Useful gains	579.3169	620.6586	646.4340	653.6006	611.1574	479.9248	333.6939	347.8757	479.9781	542.8794	548.8611	556.9942 (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	1397.4728	1352.5683	1222.5086	1023.5959	785.1271	527.0637	342.4031	360.7977	568.9110	868.3624	1160.5209	1403.0716 (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	608.7080	491.8433	428.5995	266.3967	129.4335	0.0000	0.0000	0.0000	0.0000	242.1593	440.3950	629.4816 (98)
Space heating												3237.0169 (98)
Space heating per m2												45.4254 (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													3568.9272 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	608.7080	491.8433	428.5995	266.3967	129.4335	0.0000	0.0000	0.0000	0.0000	242.1593	440.3950	629.4816	(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)	671.1224	542.2749	472.5463	293.7119	142.7050	0.0000	0.0000	0.0000	0.0000	266.9893	485.5513	694.0260	(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	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443	(64)
Efficiency of water heater (217)m	89.8460	89.7890	89.6582	89.3698	88.7402	87.0000	87.0000	87.0000	87.0000	89.2554	89.6901	87.0000	(216)
Fuel for water heating, kWh/month	194.9955	171.6298	179.7008	160.4864	157.5662	142.4089	135.6357	150.4038	150.6354	166.6920	176.8117	189.8479	(219)
Water heating fuel used												1976.8141	(219)
Annual totals kWh/year													
Space heating fuel - main system												3568.9272	(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)													114.1659 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													189.1659 (231)
Electricity for lighting (calculated in Appendix L)													347.8545 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													6082.7617 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3568.9272	3.4800	124.1987 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1976.8141	3.4800	68.7931 (247)
Mechanical ventilation fans	114.1659	13.1900	15.0585 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	347.8545	13.1900	45.8820 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			383.8248 (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] =	1.3866 (257)
SAP value		80.6569
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	3568.9272	0.2160	770.8883 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1976.8141	0.2160	426.9918 (264)
Space and water heating			1197.8801 (265)
Pumps and fans	189.1659	0.5190	98.1771 (267)
Energy for lighting	347.8545	0.5190	180.5365 (268)
Energy saving/generation technologies			
PV Unit	-820.4600	0.5190	-425.8187 (269)
Total kg/year			1050.7750 (272)
CO2 emissions per m2			14.7500 (273)
EI value			87.8889
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8869 = 3.924$, stars = 4
Water heating environmental impact	$0.216 / 0.8869 = 0.2436$, 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	71.2600 (1b)	x 2.6800 (2b)	= 190.9768 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 190.9768 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
									Air changes per hour			
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							4.1000					
Infiltration rate							0.2050		(18)			
Number of sides sheltered							2		(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1743	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250
Adj infilt rate												
	0.2047	0.1917	0.1917	0.1743	0.1786	0.1699	0.1699	0.1655	0.1655	0.1786	0.1743	0.1786
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000
												(23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000
												(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			8.7800	1.1450	10.0534		(27)
Heat Loss Floor 1			71.2600	0.1200	8.5512		(28a)
Ground Floor Walls	89.0200	10.9000	78.1200	0.2700	21.0924		(29a)
Wall to Corridor	17.9000		17.9000	0.2041	3.6531		(29a)
Wall to Corridor	4.4600		4.4600	0.2320	1.0348		(29a)
Pitched Roof	8.8000		8.8000	0.1000	0.8800		(30)
Total net area of external elements Aum(A, m ²)			191.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	47.5969	(33)
Party Ceilings 1			63.1000				(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)							15.7013 (36)
Total fabric heat loss							(33) + (36) = 63.2982 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112	31.5112 (38)
Heat transfer coeff	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094	94.8094 (39)
Average = Sum(39)m / 12 =												94.8094 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305	1.3305 (40)
HLP (average)												1.3305 (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												2.2763 (42)
Average daily hot water use (litres/day)												88.2626 (43)
Daily hot water use	Jan 97.0889	Feb 93.5584	Mar 90.0279	Apr 86.4974	May 82.9669	Jun 79.4364	Jul 79.4364	Aug 82.9669	Sep 86.4974	Oct 90.0279	Nov 93.5584	Dec 97.0889 (44)
Energy conte	143.9800	125.9259	129.9442	113.2885	108.7030	93.8025	86.9218	99.7440	100.9352	117.6303	128.4027	139.4370 (45)
Energy content (annual)												Total = Sum(45)m = 1388.7151 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	21.5970	18.8889	19.4916	16.9933	16.3055	14.0704	13.0383	14.9616	15.1403	17.6445	19.2604	20.9155 (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	31.2157	28.1788	31.1724	30.1379	31.1214	30.0933	31.0813	31.1073	30.1176	31.1513	30.1799	31.2073 (61)
Total heat required for water heating calculated for each month	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443 (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	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443 (64)
Heat gains from water heating, kWh/month	55.6773	48.9150	50.9995	45.2029	43.9241	38.7126	36.6718	40.9417	41.0904	46.8999	50.2389	54.1646 (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	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793	136.5793 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.2424	43.7367	35.5691	26.9281	20.1290	16.9938	18.3624	23.8681	32.0357	40.6767	47.4758	50.6110 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	298.8355	301.9364	294.1221	277.4862	256.4865	236.7496	223.5642	220.4632	228.2776	244.9135	265.9132	285.6501 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343	50.9343 (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)	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529	-91.0529 (71)
Water heating gains (Table 5)	74.8351	72.7902	68.5478	62.7818	59.0378	53.7675	49.2901	55.0292	57.0700	63.0375	69.7762	72.8019 (72)
Total internal gains	522.3736	517.9240	497.6996	466.6568	435.1140	406.9717	390.6774	398.8212	416.8440	448.0884	482.6259	508.5237 (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)
Southwest			4.3200	45.0642		0.6300		0.7000		0.7700		59.4959 (79)

Solar gains	79.4140	120.9815	184.3262	255.6675	291.7863	331.2126	302.5483	271.7690	218.2267	148.8017	96.0550	63.5709 (83)
Total gains	601.7876	638.9056	682.0258	722.3243	726.9003	738.1843	693.2257	670.5902	635.0706	596.8901	578.6808	572.0945 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954	52.1954
alpha	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797	4.4797
util living area	0.9888	0.9845	0.9705	0.9296	0.8295	0.6174	0.4442	0.4452	0.7377	0.9270	0.9783	0.9906 (86)
MIT	19.8963	19.9880	20.2235	20.5382	20.8137	20.9645	20.9937	20.9938	20.9203	20.6293	20.2223	19.8722 (87)
Th 2	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170	19.8170 (88)
util rest of house	0.9849	0.9791	0.9594	0.9014	0.7597	0.4913	0.2887	0.2844	0.6207	0.8899	0.9691	0.9872 (89)
MIT 2	18.8534	18.9437	19.1740	19.4723	19.7091	19.8059	19.8163	19.8164	19.7857	19.5613	19.1756	18.8298 (90)
Living area fraction									fLA = Living area / (4) =			0.3448 (91)
MIT	19.2130	19.3037	19.5359	19.8398	20.0899	20.2054	20.2223	20.2224	20.1769	19.9295	19.5365	19.1892 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2130	19.3037	19.5359	19.8398	20.0899	20.2054	20.2223	20.2224	20.1769	19.9295	19.5365	19.1892 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	591.0956	623.5587	652.1175	651.5546	565.4014	394.8327	237.8014	228.4185	419.0079	533.7404	559.1260	563.3813 (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	1290.6366	1261.3195	1131.6331	923.4240	662.7117	408.1931	239.1366	229.6646	452.8940	742.3121	1036.8814	1278.9051 (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	520.4585	428.5753	356.7596	195.7460	72.3989	0.0000	0.0000	0.0000	0.0000	155.1774	343.9839	532.3497 (98)
Space heating												2605.4493 (98)
Space heating per m2										(98) / (4) =		36.5626 (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												2872.6012 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	520.4585	428.5753	356.7596	195.7460	72.3989	0.0000	0.0000	0.0000	0.0000	155.1774	343.9839	532.3497 (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)	573.8242	472.5196	393.3402	215.8170	79.8223	0.0000	0.0000	0.0000	0.0000	171.0886	379.2546	586.9347 (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	175.1957	154.1046	161.1166	143.4264	139.8245	123.8957	118.0030	130.8513	131.0528	148.7816	158.5826	170.6443 (64)
Efficiency of water heater (217)m	89.7388	89.6912	89.5156	89.0977	88.2278	87.0000	87.0000	87.0000	87.0000	88.8504	89.4989	87.0000 (216)
Fuel for water heating, kWh/month	195.2284	171.8170	179.9871	160.9766	158.4811	142.4089	135.6357	150.4038	150.6354	167.4518	177.1894	190.0837 (219)
Water heating fuel used												1980.2990 (219)
Annual totals kWh/year												
Space heating fuel - main system												2872.6012 (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)												114.1659 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												189.1659 (231)
Electricity for lighting (calculated in Appendix L)												347.8545 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												5389.9206 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2872.6012	3.6300	104.2754 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1980.2990	3.6300	71.8849 (247)
Mechanical ventilation fans	114.1659	19.4400	22.1939 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	347.8545	19.4400	67.6229 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	19.4400	0.0000 (252)
Total energy cost			375.5571 (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	2872.6012	0.2160	620.4819 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1980.2990	0.2160	427.7446 (264)
Space and water heating			1048.2264 (265)
Pumps and fans	189.1659	0.5190	98.1771 (267)
Energy for lighting	347.8545	0.5190	180.5365 (268)
Energy saving/generation technologies			
PV Unit	-820.4600	0.5190	-425.8187 (269)
Total kg/year			901.1213 (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	2872.6012	1.2200	3504.5734 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1980.2990	1.2200	2415.9648 (264)
Space and water heating			5920.5382 (265)
Pumps and fans	189.1659	3.0700	580.7394 (267)
Energy for lighting	347.8545	3.0700	1067.9134 (268)
Energy saving/generation technologies			
PV Unit	-820.4600	3.0700	-2518.8122 (269)
Primary energy kWh/year			5050.3788 (272)
Primary energy kWh/m2/year			70.8726 (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	£104	£104	£0
Mains gas	£271	£271	£0
Space heating	£236	£236	£0
Water heating	£72	£72	£0
Lighting	£68	£68	£0
Total cost of fuels	£375	£375	£0
Total cost of uses	£376	£376	£0
Delivered energy	76 kWh/m²	76 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	13 kg/m²	13 kg/m²	0 kg/m²
Primary energy	71 kWh/m²	71 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 92	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	8 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	17.06	TER	21.57
Environmental	88 B	% DER<TER	20.92		
CO ₂ Emissions (t/year)	0.90	DFEE	61.49	TREE	64.19
General Requirements Compliance	Pass	% DFEE<TFEE	4.21		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Earthwool Loft Roll 40						
	Main construction	150	0.0400	3.7500	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Earthwool Loft Roll 40						
	Main construction	200	0.0400	5.0000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Earthwool Loft Roll 40						
	Main construction	100	0.0400	2.5000	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance:	Upper limit = 11.200 m ² K/W	Lower limit = 10.901 m ² K/W	Average = 11.050 m ² K/W
	Total correction = 0.0065 m ² K/W	U-value (unrounded) = 0.1 W/m ² K	

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Flat 92	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	8 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	17.06	TER	21.57
Environmental	88 B	% DER<TER	20.92		
CO ₂ Emissions (t/year)	0.90	DFEE	61.49	TFEE	64.19
General Requirements Compliance	Pass	% DFEE<TFEE	4.21		

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 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 92	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	8 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	17.06	TER	21.57
Environmental	88 B	% DER<TER	20.92		
CO ₂ Emissions (t/year)	0.90	DFEE	61.49	TFEE	64.19
General Requirements Compliance	Pass	% DFEE<TFEE	4.21		

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 92	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	8 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	17.06	TER	21.57
Environmental	88 B	% DER<TER	20.92		
CO ₂ Emissions (t/year)	0.90	DFEE	61.49	TFEE	64.19
General Requirements Compliance	Pass	% DFEE<TFEE	4.21		

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

Wall 000001

Wall Type: Standard Wall

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

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

U-VALUE CALCULATOR REPORT

Unheated space: None

Total thickness: 355 mm

U-value: 0.25 W/m² K

Kappa: 113.50 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Flat 92	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Project	8 Haines Crescent, WEST END, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	81 B	DER	17.06	TER	21.57
Environmental	88 B	% DER<TER	20.92		
CO ₂ Emissions (t/year)	0.90	DFEE	61.49	TFEE	64.19
General Requirements Compliance	Pass	% DFEE<TFEE	4.21		

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 92	Issued on Date	02/08/2022
Assessment Reference	As Built	Prop Type Ref	J (HA-AR)
Property	8 Haines Crescent, WEST END, SO30 3LG		
SAP Rating	81 B	DER	17.06
Environmental	88 B	TER	21.57
CO ₂ Emissions (t/year)	0.90	% DER<TER	20.92
General Requirements Compliance	Pass	DFEE	61.49
		TFEE	64.19
		% DFEE<TFEE	4.21
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

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

Orientation	South West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Detached
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements				
	Ground Floor:	Heat Loss Perimeter 41.56 m	Internal Floor Area 71.26 m ²	Average Storey Height 2.68 m

7.0 Living Area	24.57	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	89.02	78.12
Wall to Corridor	Cavity Wall	0.25	17.90	17.90
Wall to Corridor	Cavity Wall	0.25	4.46	4.46

10.0 External Roofs				
Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Roof	External Plane Roof	0.10	8.80	8.80

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	71.26

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	[1] Ground Floor Walls	South West							2.12	
Front Elevation	Window	[1] Ground Floor Walls	South West	None	0.00					4.32	
Rear Elevation	Window	[1] Ground Floor Walls	North East	None	0.00					4.46	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	7.58	0.300	No
Table K1 - Approved	E3 Sill	6.57	0.040	No
Table K1 - Approved	E4 Jamb	17.40	0.050	No
Table K1 - Approved	E5 Ground floor (normal)	41.56	0.160	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	34.96	0.070	No
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	2.97	0.060	No
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	2.79	0.240	No
Table K1 - Approved	E12 Gable (insulation at ceiling level)	5.76	0.240	No
Table K1 - Approved	E16 Corner (normal)	18.79	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	8.04	-0.090	No

Y-value 0.082 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ? Yes

As Built AP₅₀ 4.10 m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather Windows half open

Cross ventilation possible Yes

Night Ventilation Yes

Air change rate 3.00

Mechanical Ventilation

Mechanical Ventilation System Present Yes

Approved Installation No

Mechanical Ventilation data Type Database

Type Mechanical extract ventilation - centralised

MV Reference Number 500233

Configuration 1

Manufacturer SFP 0.35

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Duct Type	Rigid
Wet Rooms	1

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

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

External

External lights fitted No

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

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

25.0 Main Heating 2

None

Community Heating None

28.0 Water Heating

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Instantaneous System 1

Waste Water Heat Recovery

No

Instantaneous System 2

Waste Water Heat Recovery

No

Storage System

Solar Panel

No

Water use <= 125 litres/person/day

Yes

SAP Code

901

29.0 Hot Water Cylinder

None

32.0 Photovoltaic Unit

More Dwellings, One Block

Apportioned

820.46

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 %			