



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 20 Haines Crescent
West End, Southampton, SO30 3LG

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

Report Issue Date: 12/05/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 77	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Property	20 Haines Crescent, West End, Southampton, SO30 3LG		
SAP Rating	88 B	DER	13.48
Environmental	88 B	TER	16.69
CO ₂ Emissions (t/year)	1.20	% DER<TER	19.22
General Requirements Compliance	Pass	DfEE	49.86
		TfEE	57.46
		% DfEE<TfEE	13.23
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TfEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	16.69	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.48	kgCO ₂ /m ²	Pass
	-3.21 (-19.2%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	57.46	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	49.86	kWh/m ² /yr	
	-7.6 (-13.2%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	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	1.19 (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	4.57 (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 4000 GR4700iW 18 S NG

Efficiency: 89.5% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.73 kWh/day
Permitted by DBSCG 2.33

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

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

0.59 m², No overhang

Windows facing East

10.04 m², No overhang

Windows facing South

5.40 m², No overhang

Windows facing South West

1.44 m², No overhang

Windows facing West

8.33 m², No overhang

Windows facing North West

1.44 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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)

10 Key features

Party wall U-value	0.00	W/m ² K
Roof U-value	0.10	W/m ² K
Floor U-value	0.12	W/m ² K
Door U-value	1.10	W/m ² K
Photovoltaic array	1.17	kW

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



THERMAL BRIDGING

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 77	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Property	20 Haines Crescent, West End, Southampton, SO30 3LG		
SAP Rating	88 B	DER	13.48
Environmental	88 B	TER	16.69
CO ₂ Emissions (t/year)	1.20	% DER<TER	19.22
General Requirements Compliance	Pass	DFEE	49.86
		TFEE	57.46
		% DFEE<TFEE	13.23
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	0.65	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Default	1.000	4.62	4.62	
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	0.91	0.06	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.01	0.07	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	8.40	0.56	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.070	3.02	0.21	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	4.14	0.26	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	18.13	0.38	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	42.00	0.67	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	37.15	5.94	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	34.91	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	19.43	1.17	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	0.240	3.58	0.86	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	14.88	0.80	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.039	34.79	1.36	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	14.59	-1.33	Knauf P24

Total: **15.70** W/mK:
Y-Value: **0.051** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 77				Issued on Date	12/05/2022
Assessment Reference	As Built		Prop Type Ref	Nv		
Property	20 Haines Crescent, West End, Southampton, SO30 3LG					
SAP Rating	88 B	DER	13.48	TER	16.69	
Environmental	88 B	% DER<TER	19.22			
CO ₂ Emissions (t/year)	1.20	DFEE	49.86	TFEE	57.46	
General Requirements Compliance	Pass	% DFEE<TFEE	13.23			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Detached House, total floor area 125 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) 16.69 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.48 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)49.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.19 (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: 4.57 (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 4000 GR4700iW 18 S NG

Efficiency: 89.5% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.73 kWh/day
Permitted by DBSCG 2.33 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average
Windows facing North: 0.59 m², No overhang
Windows facing East: 10.04 m², No overhang
Windows facing South: 5.40 m², No overhang
Windows facing South West: 1.44 m², No overhang
Windows facing West: 8.33 m², No overhang
Windows facing North West: 1.44 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 1.17 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.5200 (1b)	x 2.3800 (2b)	= 151.1776 (1b) - (3b)
First floor	61.7800 (1c)	x 2.6700 (2c)	= 164.9526 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 316.1302 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1582 (8)
Pressure test					Yes
Measured/design AP50					4.5700
Infiltration rate					0.3867 (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) =	0.3287 (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	0.4190	0.4108	0.4026	0.3615	0.3533	0.3122	0.3122	0.3040	0.3287	0.3533	0.3697	0.3862 (22b)
Effective ac	0.5878	0.5844	0.5810	0.5654	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5684	0.5746 (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)			27.2400	1.1450	31.1908		(27)
Ground Floor			63.5200	0.1200	7.6224	84.0000	5335.6800 (28a)
Brick and Block	181.6300	29.3600	152.2700	0.2400	36.5448	42.2200	6428.8394 (29a)
Pitched Roof	63.5200		63.5200	0.1000	6.3520	9.1000	578.0320 (30)
Total net area of external elements Aum(A, m ²)			308.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.0420		(33)
GF Block			57.3300			75.0000	4299.7500 (32c)
GF Stud			32.8200			9.0000	295.3800 (32c)
FF Stud			147.4900			9.0000	1327.4100 (32c)
Internal Floor 1			61.7800			18.0000	1112.0400 (32d)
Internal Ceiling 1			61.7800			18.0000	1112.0400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20489.1714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 163.5209 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.6990 (36)
Total fabric heat loss (33) + (36) = 99.7410 (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	61.3210	60.9653	60.6167	58.9792	58.6728	57.2466	57.2466	56.9825	57.7959	58.6728	59.2926	59.9406 (38)
Heat transfer coeff	161.0620	160.7064	160.3577	158.7202	158.4138	156.9876	156.9876	156.7235	157.5370	158.4138	159.0336	159.6816 (39)
Average = Sum(39)m / 12 =												158.7187 (39)
HLP	1.2854	1.2826	1.2798	1.2667	1.2643	1.2529	1.2529	1.2508	1.2573	1.2643	1.2692	1.2744 (40)
HLP (average)												1.2667 (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												2.8817 (42)
Average daily hot water use (litres/day)												102.6397 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.9036	108.7980	104.6925	100.5869	96.4813	92.3757	92.3757	96.4813	100.5869	104.6925	108.7980	112.9036 (44)
Energy conte	167.4328	146.4378	151.1107	131.7420	126.4096	109.0818	101.0804	115.9912	117.3765	136.7910	149.3181	162.1497 (45)
Energy content (annual)										Total = Sum(45)m =		1614.9216 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.1149	21.9657	22.6666	19.7613	18.9614	16.3623	15.1621	17.3987	17.6065	20.5186	22.3977	24.3225 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
219.6554 193.6066 203.3333 182.2800 178.6322 159.6198 153.3030 168.2138 167.9145 189.0136 199.8561 214.3723 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	219.6554	193.6066	203.3333	182.2800	178.6322	159.6198	153.3030	168.2138	167.9145	189.0136	199.8561	214.3723 (64)
Total per year (kWh/year) = Sum(64)m =												2229.8006 (64)
Heat gains from water heating, kWh/month	97.4495	86.4256	92.0224	84.2346	83.8093	76.7001	75.3873	80.3452	79.4581	87.2611	90.0787	95.6929 (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	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0490	23.1365	18.8159	14.2448	10.6482	8.9896	9.7136	12.6261	16.9468	21.5178	25.1145	26.7730	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	291.9617	294.9914	287.3567	271.1035	250.5868	231.3040	218.4218	215.3922	223.0268	239.2800	259.7967	279.0796	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	(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)	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	(71)
Water heating gains (Table 5)	130.9805	128.6095	123.6860	116.9925	112.6469	106.5279	101.3270	107.9908	110.3585	117.2864	125.1092	128.6195	(72)
Total internal gains	518.2163	515.9625	499.0837	471.5659	443.1069	416.0466	398.6875	405.2342	419.5571	447.3093	479.2455	503.6971	(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		
North				0.5900	10.6334	0.6300	0.7000		0.7700	1.9173 (74)		
East				10.0400	19.6403	0.6300	0.7000		0.7700	60.2633 (76)		
South				5.4000	46.7521	0.6300	0.7000		0.7700	77.1554 (78)		
Southwest				1.4400	36.7938	0.6300	0.7000		0.7700	16.1923 (79)		
West				8.3300	19.6403	0.6300	0.7000		0.7700	49.9993 (80)		
Northwest				1.4400	11.2829	0.6300	0.7000		0.7700	4.9654 (81)		
Solar gains	210.4931	383.4107	578.3580	786.6582	930.5344	941.6620	900.7172	793.2143	651.8189	439.4316	256.9477	176.8546 (83)
Total gains	728.7094	899.3731	1077.4417	1258.2242	1373.6413	1357.7085	1299.4048	1198.4485	1071.3760	886.7409	736.1933	680.5518 (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	35.3369	35.4151	35.4921	35.8583	35.9276	36.2540	36.2540	36.3151	36.1276	35.9276	35.7876	35.6424
alpha	3.3558	3.3610	3.3661	3.3906	3.3952	3.4169	3.4169	3.4210	3.4085	3.3952	3.3858	3.3762
util living area	0.9909	0.9811	0.9583	0.9026	0.7987	0.6465	0.5010	0.5544	0.7787	0.9397	0.9838	0.9927 (86)
MIT	19.0367	19.2976	19.7084	20.2133	20.6228	20.8723	20.9600	20.9432	20.7461	20.1834	19.5111	18.9920 (87)
Th 2	19.8523	19.8545	19.8567	19.8670	19.8689	19.8779	19.8779	19.8796	19.8745	19.8689	19.8650	19.8609 (88)
util rest of house	0.9887	0.9767	0.9482	0.8786	0.7489	0.5607	0.3858	0.4377	0.7063	0.9198	0.9792	0.9910 (89)
MIT 2	18.0718	18.3320	18.7375	19.2303	19.6028	19.8102	19.8645	19.8587	19.7208	19.2143	18.5536	18.0338 (90)
Living area fraction	18.2083	18.4685	18.8748	19.3693	19.7471	19.9604	20.0194	20.0121	19.8658	19.3514	18.6890	18.1693 (92)
MIT	18.2083	18.4685	18.8748	19.3693	19.7471	19.9604	20.0194	20.0121	19.8658	19.3514	18.6890	18.1693 (93)
Temperature adjustment												0.0000
adjusted MIT	18.2083	18.4685	18.8748	19.3693	19.7471	19.9604	20.0194	20.0121	19.8658	19.3514	18.6890	18.1693 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9843	0.9694	0.9371	0.8659	0.7428	0.5675	0.4011	0.4525	0.7057	0.9081	0.9726	0.9873 (94)
Useful gains	717.2734	871.8640	1009.7063	1089.4898	1020.3572	770.5299	521.1268	542.2770	756.0229	805.2168	716.0575	671.9108 (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	2240.0985	2180.5505	1984.3936	1661.6921	1274.7653	841.5171	536.8072	566.0988	908.3227	1386.3352	1843.0441	2230.6403 (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	1132.9819	879.4373	725.1674	411.9857	189.2796	0.0000	0.0000	0.0000	0.0000	432.3521	811.4304	1159.6947 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating
Space heating per m2 (98) / (4) = 5742.3291 (98)
45.8286 (99)

8c. Space cooling requirement

Not applicable

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 %) 90.5000 (206)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating requirement 6345.1150 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1132.9819	879.4373	725.1674	411.9857	189.2796	0.0000	0.0000	0.0000	0.0000	432.3521	811.4304	1159.6947
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000
Space heating fuel (main heating system)	1251.9137	971.7540	801.2899	455.2328	209.1487	0.0000	0.0000	0.0000	0.0000	477.7371	896.6081	1281.4306
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
Water heating requirement	219.6554	193.6066	203.3333	182.2800	178.6322	159.6198	153.3030	168.2138	167.9145	189.0136	199.8561	214.3723
Efficiency of water heater (217)m	88.5714	88.3623	87.9184	86.9249	84.9684	79.8000	79.8000	79.8000	79.8000	86.9534	88.1638	88.6456
Fuel for water heating, kWh/month	247.9980	219.1055	231.2750	209.6981	210.2337	200.0249	192.1090	210.7942	210.4192	217.3735	226.6873	241.8307
Water heating fuel used												2617.5491
Annual totals kWh/year												
Space heating fuel - main system												6345.1150
Space heating fuel - secondary												0.0000
Electricity for pumps and fans:												
central heating pump												30.0000
main heating flue fan												45.0000
Total electricity for the above, kWh/year												75.0000
Electricity for lighting (calculated in Appendix L)												460.0342
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.17 * 1080 * 1.00) =									-1010.4350			-1010.4350
Total delivered energy for all uses												8487.2633

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	6345.1150	0.2160	1370.5448 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2617.5491	0.2160	565.3906 (264)
Space and water heating			1935.9355 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	460.0342	0.5190	238.7577 (268)
Energy saving/generation technologies			
PV Unit	-1010.4350	0.5190	-524.4158 (269)
Total CO2, kg/year			1689.2024 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.4800 (273)

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

	DER	TFA	N	EF	CO2 emissions
Total Floor Area		125.3000			13.4800 ZC1
Assumed number of occupants			2.8817		125.3000 ZC2
CO2 emission factor in Table 12 for electricity displaced from grid				0.5190	2.8817 ZC3
CO2 emissions from appliances, equation (L14)					13.8077 ZC2
CO2 emissions from cooking, equation (L16)					1.5017 ZC3
Total CO2 emissions					28.7894 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					28.7894 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	63.5200 (1b)	x 2.3800 (2b)	= 151.1776 (1b) - (3b)
First floor	61.7800 (1c)	x 2.6700 (2c)	= 164.9526 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 316.1302 (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																4 * 10 =	40.0000 (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) =					40.0000	/ (5) =	0.1265 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3765 (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) =					0.3201	(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)				
Adj infilt rate	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)				
	0.4081	0.4001	0.3921	0.3521	0.3441	0.3040	0.3040	0.2960	0.3201	0.3441	0.3601	0.3761	(22b)				
Effective ac	0.5833	0.5800	0.5769	0.5620	0.5592	0.5462	0.5462	0.5438	0.5512	0.5592	0.5648	0.5707	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			27.2400	1.3258	36.1136		(27)					
Ground Floor			63.5200	0.1300	8.2576		(28a)					
Brick and Block	181.6300	29.3600	152.2700	0.1800	27.4086		(29a)					
Pitched Roof	63.5200		63.5200	0.1300	8.2576		(30)					
Total net area of external elements Aum(A, m2)			308.6700				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		82.1574		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8238 (36)					
Total fabric heat loss						(33) + (36) =	96.9812 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 60.8472	Feb 60.5100	Mar 60.1794	Apr 58.6265	May 58.3360	Jun 56.9836	Jul 56.9836	Aug 56.7331	Sep 57.5045	Oct 58.3360	Nov 58.9238	Dec 59.5382 (38)
Heat transfer coeff	157.8285	157.4912	157.1606	155.6078	155.3173	153.9648	153.9648	153.7143	154.4857	155.3173	155.9050	156.5194 (39)
Average = Sum(39)m / 12 =												155.6064 (39)
HLP	Jan 1.2596	Feb 1.2569	Mar 1.2543	Apr 1.2419	May 1.2396	Jun 1.2288	Jul 1.2288	Aug 1.2268	Sep 1.2329	Oct 1.2396	Nov 1.2443	Dec 1.2492 (40)
HLP (average)												1.2419 (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												2.8817 (42)
Average daily hot water use (litres/day)												102.6397 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.9036	108.7980	104.6925	100.5869	96.4813	92.3757	92.3757	96.4813	100.5869	104.6925	108.7980	112.9036 (44)
Energy conte	167.4328	146.4378	151.1107	131.7420	126.4096	109.0818	101.0804	115.9912	117.3765	136.7910	149.3181	162.1497 (45)
Energy content (annual)											Total = Sum(45)m =	1614.9216 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	25.1149	21.9657	22.6666	19.7613	18.9614	16.3623	15.1621	17.3987	17.6065	20.5186	22.3977	24.3225 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7258 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)	0.9319 (55)											
Total storage loss	28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896 (56)
If cylinder contains dedicated solar storage	28.8896	26.0938	28.8896	27.9576	28.8896	27.9576	28.8896	28.8896	27.9576	28.8896	27.9576	28.8896 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	219.5848	193.5428	203.2627	182.2116	178.5615	159.5515	153.2323	168.1431	167.8461	188.9429	199.7877	214.3017 (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	219.5848	193.5428	203.2627	182.2116	178.5615	159.5515	153.2323	168.1431	167.8461	188.9429	199.7877	214.3017 (64)
Heat gains from water heating, kWh/month	97.3930	86.3746	91.9659	84.1799	83.7527	76.6454	75.3308	80.2886	79.4034	87.2046	90.0240	95.6364 (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	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0490	23.1365	18.8159	14.2448	10.6482	8.9896	9.7136	12.6261	16.9468	21.5178	25.1145	26.7730	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	291.9617	294.9914	287.3567	271.1035	250.5868	231.3040	218.4218	215.3922	223.0268	239.2800	259.7967	279.0796	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	(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)	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	(71)
Water heating gains (Table 5)	130.9045	128.5336	123.6100	116.9165	112.5709	106.4520	101.2510	107.9148	110.2825	117.2104	125.0333	128.5435	(72)
Total internal gains	518.1403	515.8865	499.0077	471.4900	443.0309	415.9706	398.6116	405.1582	419.4811	447.2333	479.1696	503.6211	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.5900	10.6334	0.6300	0.7000	0.7700	1.9173	(74)
East	10.0400	19.6403	0.6300	0.7000	0.7700	60.2633	(76)
South	5.4000	46.7521	0.6300	0.7000	0.7700	77.1554	(78)
Southwest	1.4400	36.7938	0.6300	0.7000	0.7700	16.1923	(79)
West	8.3300	19.6403	0.6300	0.7000	0.7700	49.9993	(80)
Northwest	1.4400	11.2829	0.6300	0.7000	0.7700	4.9654	(81)

Solar gains	210.4931	383.4107	578.3580	786.6582	930.5344	941.6620	900.7172	793.2143	651.8189	439.4316	256.9477	176.8546	(83)
Total gains	728.6334	899.2972	1077.3657	1258.1482	1373.5653	1357.6326	1299.3288	1198.3725	1071.3000	886.6649	736.1173	680.4758	(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	55.1319	55.2500	55.3662	55.9187	56.0233	56.5154	56.5154	56.6075	56.3249	56.0233	55.8121	55.5930
alpha	4.6755	4.6833	4.6911	4.7279	4.7349	4.7677	4.7677	4.7738	4.7550	4.7349	4.7208	4.7062
util living area	0.9982	0.9950	0.9841	0.9452	0.8457	0.6745	0.5099	0.5696	0.8242	0.9728	0.9960	0.9987 (86)
MIT	19.5976	19.7936	20.1036	20.4887	20.7914	20.9486	20.9890	20.9819	20.8649	20.4448	19.9434	19.5644 (87)
Th 2	19.8726	19.8747	19.8768	19.8866	19.8885	19.8971	19.8971	19.8986	19.8937	19.8885	19.8848	19.8809 (88)
util rest of house	0.9976	0.9932	0.9783	0.9251	0.7924	0.5784	0.3880	0.4433	0.7448	0.9590	0.9943	0.9983 (89)
MIT 2	18.0096	18.2970	18.7475	19.2974	19.6904	19.8643	19.8932	19.8916	19.7886	19.2487	18.5235	17.9668 (90)
Living area fraction	18.2342	18.5086	18.9393	19.4659	19.8461	20.0176	20.0482	20.0458	19.9408	19.4178	18.7243	18.1927 (91)
MIT	18.2342	18.5086	18.9393	19.4659	19.8461	20.0176	20.0482	20.0458	19.9408	19.4178	18.7243	18.1927 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2342	18.5086	18.9393	19.4659	19.8461	20.0176	20.0482	20.0458	19.9408	19.4178	18.7243	18.1927 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9962	0.9900	0.9716	0.9155	0.7901	0.5897	0.4052	0.4609	0.7487	0.9509	0.9915	0.9972	(94)
Ext temp.	725.8444	890.2947	1046.7841	1151.8273	1085.2246	800.5704	526.4752	552.3828	802.0737	843.1703	729.8661	678.5587	(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	2199.2121	2143.2390	1954.9615	1644.1379	1265.2313	834.1239	530.9028	560.4060	902.3274	1369.5617	1812.2809	2190.1336	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating	1096.1856	841.9786	675.6840	354.4636	133.9250	0.0000	0.0000	0.0000	0.0000	391.6352	779.3387	1124.6117	(98)
Space heating per m ²												5397.8224	(98)
												43.0792	(99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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 %)

93.5000 (206)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

Space heating requirement

5773.0721 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1096.1856	841.9786	675.6840	354.4636	133.9250	0.0000	0.0000	0.0000	0.0000	391.6352	779.3387	1124.6117	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1172.3910	900.5119	722.6567	379.1055	143.2353	0.0000	0.0000	0.0000	0.0000	418.8612	833.5173	1202.7933	(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	219.5848	193.5428	203.2627	182.2116	178.5615	159.5515	153.2323	168.1431	167.8461	188.9429	199.7877	214.3017	(64)
Efficiency of water heater (217)m	88.5192	88.2874	87.7782	86.5594	84.0594	79.8000	79.8000	79.8000	79.8000	86.7160	88.0899	88.5986	(216)
Fuel for water heating, kWh/month	248.0646	219.2190	231.5640	210.5046	212.4229	199.9392	192.0204	210.7057	210.3335	217.8870	226.7998	241.8794	(219)
Water heating fuel used												2621.3402	(219)
Annual totals kWh/year													
Space heating fuel - main system												5773.0721	(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)												460.0342	(232)
Total delivered energy for all uses												8929.4465	(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	5773.0721	0.2160	1246.9836 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2621.3402	0.2160	566.2095 (264)
Space and water heating			1813.1931 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	460.0342	0.5190	238.7577 (268)
Total CO2, kg/m2/year			2090.8758 (272)
Emissions per m2 for space and water heating			14.4708 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.9055 (272b)
Emissions per m2 for pumps and fans			0.3107 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4708 * 1.00) + 1.9055 + 0.3107, rounded to 2 d.p.			16.6900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.5200 (1b)	x 2.3800 (2b)	= 151.1776 (1b) - (3b)
First floor	61.7800 (1c)	x 2.6700 (2c)	= 164.9526 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 316.1302 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1265 (8)
Pressure test					Yes
Measured/design AP50					4.5700
Infiltration rate					0.3550 (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) =	0.3018 (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	0.3848	0.3772	0.3697	0.3320	0.3244	0.2867	0.2867	0.2791	0.3018	0.3244	0.3395	0.3546 (22b)
Effective ac	0.5740	0.5711	0.5683	0.5551	0.5526	0.5411	0.5411	0.5390	0.5455	0.5526	0.5576	0.5629 (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)			27.2400	1.1450	31.1908		(27)
Ground Floor			63.5200	0.1200	7.6224	84.0000	5335.6800 (28a)
Brick and Block	181.6300	29.3600	152.2700	0.2400	36.5448	42.2200	6428.8394 (29a)
Pitched Roof	63.5200		63.5200	0.1000	6.3520	9.1000	578.0320 (30)
Total net area of external elements Aum(A, m ²)			308.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.0420		(33)
GF Block			57.3300			75.0000	4299.7500 (32c)
GF Stud			32.8200			9.0000	295.3800 (32c)
FF Stud			147.4900			9.0000	1327.4100 (32c)
Internal Floor 1			61.7800			18.0000	1112.0400 (32d)
Internal Ceiling 1			61.7800			9.0000	556.0200 (32e)

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

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 59.8836	Feb 59.5838	Mar 59.2899	Apr 57.9093	May 57.6510	Jun 56.4486	Jul 56.4486	Aug 56.2259	Sep 56.9118	Oct 57.6510	Nov 58.1735	Dec 58.7198 (38)
Heat transfer coeff	159.6247	159.3248	159.0309	157.6503	157.3920	156.1896	156.1896	155.9670	156.6528	157.3920	157.9146	158.4609 (39)
Average = Sum(39)m / 12 =												157.6491 (39)

HLP	Jan 1.2739	Feb 1.2715	Mar 1.2692	Apr 1.2582	May 1.2561	Jun 1.2465	Jul 1.2465	Aug 1.2447	Sep 1.2502	Oct 1.2561	Nov 1.2603	Dec 1.2647 (40)
HLP (average)												1.2582 (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												2.8817 (42)
Average daily hot water use (litres/day)												102.6397 (43)
Daily hot water use	Jan 112.9036	Feb 108.7980	Mar 104.6925	Apr 100.5869	May 96.4813	Jun 92.3757	Jul 92.3757	Aug 96.4813	Sep 100.5869	Oct 104.6925	Nov 108.7980	Dec 112.9036 (44)
Energy conte	167.4328	146.4378	151.1107	131.7420	126.4096	109.0818	101.0804	115.9912	117.3765	136.7910	149.3181	162.1497 (45)
Energy content (annual)										Total = Sum(45)m =		1614.9216 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	35.5795	31.1180	32.1110	27.9952	26.8620	23.1799	21.4796	24.6481	24.9425	29.0681	31.7301	34.4568 (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	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0490	23.1365	18.8159	14.2448	10.6482	8.9896	9.7136	12.6261	16.9468	21.5178	25.1145	26.7730	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	291.9617	294.9914	287.3567	271.1035	250.5868	231.3040	218.4218	215.3922	223.0268	239.2800	259.7967	279.0796	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	(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)	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	(71)
Water heating gains (Table 5)	47.8219	46.3066	43.1600	38.8822	36.1049	32.1943	28.8704	33.1292	34.6424	39.0700	44.0696	46.3129	(72)
Total internal gains	432.0577	430.6595	415.5577	390.4556	363.5649	338.7130	323.2309	327.3726	340.8410	366.0929	395.2058	418.3906	(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
North				0.5900	10.6334		0.6300		0.7000		0.7700		1.9173 (74)
East				10.0400	19.6403		0.6300		0.7000		0.7700		60.2633 (76)
South				5.4000	46.7521		0.6300		0.7000		0.7700		77.1554 (78)
Southwest				1.4400	36.7938		0.6300		0.7000		0.7700		16.1923 (79)
West				8.3300	19.6403		0.6300		0.7000		0.7700		49.9993 (80)
Northwest				1.4400	11.2829		0.6300		0.7000		0.7700		4.9654 (81)
Solar gains	210.4931	383.4107	578.3580	786.6582	930.5344	941.6620	900.7172	793.2143	651.8189	439.4316	256.9477	176.8546	(83)
Total gains	642.5508	814.0702	993.9157	1177.1138	1294.0993	1280.3749	1223.9482	1120.5869	992.6599	805.5245	652.1536	595.2452	(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	34.6875	34.7528	34.8171	35.1219	35.1796	35.4504	35.4504	35.5010	35.3456	35.1796	35.0632	34.9423	
alpha	3.3125	3.3169	3.3211	3.3415	3.3453	3.3634	3.3634	3.3667	3.3564	3.3453	3.3375	3.3295	
util living area	0.9932	0.9847	0.9643	0.9130	0.8148	0.6680	0.5231	0.5804	0.8021	0.9503	0.9877	0.9947	(86)
MIT	18.9326	19.2008	19.6244	20.1474	20.5808	20.8518	20.9517	20.9311	20.7080	20.1076	19.4133	18.8844	(87)
Th 2	19.8613	19.8632	19.8650	19.8737	19.8754	19.8830	19.8830	19.8844	19.8800	19.8754	19.8721	19.8686	(88)
util rest of house	0.9916	0.9812	0.9557	0.8913	0.7677	0.5832	0.4056	0.4621	0.7338	0.9337	0.9843	0.9934	(89)
MIT 2	17.9782	18.2458	18.6649	19.1768	19.5750	19.8024	19.8662	19.8581	19.6985	19.1505	18.4653	17.9355	(90)
Living area fraction									fLA = Living area / (4) =			0.1414	(91)
MIT	18.1131	18.3809	18.8006	19.3141	19.7172	19.9508	20.0197	20.0098	19.8412	19.2858	18.5993	18.0697	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1131	18.3809	18.8006	19.3141	19.7172	19.9508	20.0197	20.0098	19.8412	19.2858	18.5993	18.0697	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9880	0.9748	0.9451	0.8781	0.7601	0.5888	0.4209	0.4765	0.7311	0.9222	0.9787	0.9905	(94)
Useful gains	634.8482	793.5179	939.3953	1033.6812	983.5896	753.8932	515.1021	533.9751	725.7080	742.8387	638.2891	589.6186	(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	2204.9184	2147.8347	1956.1801	1641.7800	1261.8465	835.7398	534.1220	563.0173	899.3826	1367.0810	1815.9140	2197.8007	(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	1168.1323	910.1009	756.4879	437.8312	207.0232	0.0000	0.0000	0.0000	0.0000	464.4363	847.8899	1196.4875	(98)
Space heating												5988.3891	(98)
Space heating per m2										(98) / (4) =		47.7924	(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	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1468.1825	1155.8033	1185.3489	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8057	0.8678	0.8365	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1182.9492	1003.0022	991.5351	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1613.3471	1544.7487	1426.1141	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	309.8865	403.0594	323.3268	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												1036.2727	(104)
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	77.4716	100.7649	80.8317	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												259.0682	(107)
Space cooling per m2												2.0676	(108)
Energy for space heating												47.7924	(99)
Energy for space cooling												2.0676	(108)
Total												49.8600	(109)
Dwelling Fabric Energy Efficiency (DFEE)												49.9	(109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.5200 (1b)	x 2.3800 (2b)	= 151.1776 (1b) - (3b)
First floor	61.7800 (1c)	x 2.6700 (2c)	= 164.9526 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 316.1302 (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																4 * 10 =	40.0000 (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) =					40.0000	/ (5) =	0.1265 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3765 (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) =					0.3201	(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)				
Adj infilt rate	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)				
	0.4081	0.4001	0.3921	0.3521	0.3441	0.3040	0.3040	0.2960	0.3201	0.3441	0.3601	0.3761	(22b)				
Effective ac	0.5833	0.5800	0.5769	0.5620	0.5592	0.5462	0.5462	0.5438	0.5512	0.5592	0.5648	0.5707	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			27.2400	1.3258	36.1136		(27)					
Ground Floor			63.5200	0.1300	8.2576		(28a)					
Brick and Block	181.6300	29.3600	152.2700	0.1800	27.4086		(29a)					
Pitched Roof	63.5200		63.5200	0.1300	8.2576		(30)					
Total net area of external elements Aum(A, m2)			308.6700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.1574		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8238 (36)					
Total fabric heat loss						(33) + (36) =	96.9812 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 60.8472	Feb 60.5100	Mar 60.1794	Apr 58.6265	May 58.3360	Jun 56.9836	Jul 56.9836	Aug 56.7331	Sep 57.5045	Oct 58.3360	Nov 58.9238	Dec 59.5382 (38)
Heat transfer coeff	157.8285	157.4912	157.1606	155.6078	155.3173	153.9648	153.9648	153.7143	154.4857	155.3173	155.9050	156.5194 (39)
Average = Sum(39)m / 12 =												155.6064 (39)
HLP	Jan 1.2596	Feb 1.2569	Mar 1.2543	Apr 1.2419	May 1.2396	Jun 1.2288	Jul 1.2288	Aug 1.2268	Sep 1.2329	Oct 1.2396	Nov 1.2443	Dec 1.2492 (40)
HLP (average)												1.2419 (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												2.8817 (42)
Average daily hot water use (litres/day)												102.6397 (43)
Daily hot water use	Jan 112.9036	Feb 108.7980	Mar 104.6925	Apr 100.5869	May 96.4813	Jun 92.3757	Jul 92.3757	Aug 96.4813	Sep 100.5869	Oct 104.6925	Nov 108.7980	Dec 112.9036 (44)
Energy conte	167.4328	146.4378	151.1107	131.7420	126.4096	109.0818	101.0804	115.9912	117.3765	136.7910	149.3181	162.1497 (45)
Energy content (annual)										Total = Sum(45)m =		1614.9216 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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)
	35.5795	31.1180	32.1110	27.9952	26.8620	23.1799	21.4796	24.6481	24.9425	29.0681	31.7301	34.4568 (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	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	144.0835	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0490	23.1365	18.8159	14.2448	10.6482	8.9896	9.7136	12.6261	16.9468	21.5178	25.1145	26.7730	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	291.9617	294.9914	287.3567	271.1035	250.5868	231.3040	218.4218	215.3922	223.0268	239.2800	259.7967	279.0796	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	37.4084	(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)	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	(71)
Water heating gains (Table 5)	47.8219	46.3066	43.1600	38.8822	36.1049	32.1943	28.8704	33.1292	34.6424	39.0700	44.0696	46.3129	(72)
Total internal gains	432.0577	430.6595	415.5577	390.4556	363.5649	338.7130	323.2309	327.3726	340.8410	366.0929	395.2058	418.3906	(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
North				0.5900	10.6334		0.6300		0.7000		0.7700		1.9173 (74)
East				10.0400	19.6403		0.6300		0.7000		0.7700		60.2633 (76)
South				5.4000	46.7521		0.6300		0.7000		0.7700		77.1554 (78)
Southwest				1.4400	36.7938		0.6300		0.7000		0.7700		16.1923 (79)
West				8.3300	19.6403		0.6300		0.7000		0.7700		49.9993 (80)
Northwest				1.4400	11.2829		0.6300		0.7000		0.7700		4.9654 (81)
Solar gains	210.4931	383.4107	578.3580	786.6582	930.5344	941.6620	900.7172	793.2143	651.8189	439.4316	256.9477	176.8546	(83)
Total gains	642.5508	814.0702	993.9157	1177.1138	1294.0993	1280.3749	1223.9482	1120.5869	992.6599	805.5245	652.1536	595.2452	(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	55.1319	55.2500	55.3662	55.9187	56.0233	56.5154	56.5154	56.6075	56.3249	56.0233	55.8121	55.5930	
alpha	4.6755	4.6833	4.6911	4.7279	4.7349	4.7677	4.7677	4.7738	4.7550	4.7349	4.7208	4.7062	
util living area	0.9990	0.9967	0.9884	0.9564	0.8677	0.7043	0.5383	0.6032	0.8543	0.9811	0.9976	0.9993	(86)
MIT	19.5348	19.7323	20.0464	20.4419	20.7629	20.9382	20.9862	20.9770	20.8391	20.3915	19.8825	19.5020	(87)
Th 2	19.8726	19.8747	19.8768	19.8866	19.8885	19.8971	19.8971	19.8986	19.8937	19.8885	19.8848	19.8809	(88)
util rest of house	0.9986	0.9955	0.9841	0.9395	0.8184	0.6079	0.4111	0.4723	0.7809	0.9710	0.9965	0.9990	(89)
MIT 2	18.5380	18.7366	19.0499	19.4416	19.7316	19.8695	19.8937	19.8923	19.8052	19.4014	18.8949	18.5117	(90)
Living area fraction									fLA = Living area / (4) =			0.1414	(91)
MIT	18.6790	18.8774	19.1908	19.5831	19.8774	20.0207	20.0482	20.0457	19.9514	19.5414	19.0346	18.6518	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6790	18.8774	19.1908	19.5831	19.8774	20.0207	20.0482	20.0457	19.9514	19.5414	19.0346	18.6518	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9980	0.9940	0.9805	0.9337	0.8178	0.6196	0.4291	0.4908	0.7855	0.9667	0.9954	0.9986	(94)
Ext temp.	641.2875	809.1909	974.5461	1099.1252	1058.3280	793.3289	525.2555	549.9599	779.6896	778.6826	649.1437	594.4255	(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	2269.4108	2201.3253	1994.4972	1662.3680	1270.0951	834.5929	530.9059	560.4007	903.9650	1388.7531	1860.6599	2261.9807	(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	1211.3237	935.5143	758.8436	405.5348	157.5547	0.0000	0.0000	0.0000	0.0000	453.8925	872.2916	1240.6610	(98)
Space heating per m2												6035.6163	(98)
												(98) / (4) =	48.1693 (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	1447.2691	1139.3395	1168.2290	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8683	0.9257	0.8980	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1256.6295	1054.6647	1049.0301	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1613.3471	1544.7487	1426.1141	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	256.8367	364.6225	280.5505	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												902.0096 (104)
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	64.2092	91.1556	70.1376	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												225.5024 (107)
Space cooling per m2												1.7997 (108)
Energy for space heating												48.1693 (99)
Energy for space cooling												1.7997 (108)
Total												49.9690 (109)
Target Fabric Energy Efficiency (TFEE)												57.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.5200 (1b)	x 2.3800 (2b)	= 151.1776 (1b) - (3b)
First floor	61.7800 (1c)	x 2.6700 (2c)	= 164.9526 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 316.1302 (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																5 * 10 =	50.0000 (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) =					50.0000 / (5) =	0.1582 (8)					
Pressure test															Yes						
Measured/design AP50																4.5700					
Infiltration rate																0.3867 (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) =	0.3287 (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										0.3862	0.3615	0.3615	0.3287	0.3369	0.3204	0.3204	0.3122	0.3122	0.3369	0.3287	0.3369 (22b)
Effective ac										0.5746	0.5654	0.5654	0.5540	0.5567	0.5513	0.5513	0.5487	0.5487	0.5567	0.5540	0.5567 (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)			27.2400	1.1450	31.1908		(27)
Ground Floor			63.5200	0.1200	7.6224	84.0000	5335.6800 (28a)
Brick and Block	181.6300	29.3600	152.2700	0.2400	36.5448	42.2200	6428.8394 (29a)
Pitched Roof	63.5200		63.5200	0.1000	6.3520	9.1000	578.0320 (30)
Total net area of external elements Aum(A, m ²)			308.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.0420		(33)
GF Block			57.3300			75.0000	4299.7500 (32c)
GF Stud			32.8200			9.0000	295.3800 (32c)
FF Stud			147.4900			9.0000	1327.4100 (32c)
Internal Floor 1			61.7800			18.0000	1112.0400 (32d)
Internal Ceiling 1			61.7800			18.0000	1112.0400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20489.1714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 163.5209 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.6990 (36)
Total fabric heat loss (33) + (36) = 99.7410 (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	59.9406	58.9792	58.9792	57.7959	58.0812	57.5177	57.5177	57.2466	57.2466	58.0812	57.7959	58.0812 (38)
Heat transfer coeff	159.6816	158.7202	158.7202	157.5370	157.8222	157.2588	157.2588	156.9876	156.9876	157.8222	157.5370	157.8222 (39)
Average = Sum(39)m / 12 =												157.8463 (39)
HLP	1.2744	1.2667	1.2667	1.2573	1.2596	1.2551	1.2551	1.2529	1.2529	1.2596	1.2573	1.2596 (40)
HLP (average)												1.2597 (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												2.8817 (42)
Average daily hot water use (litres/day)												102.6397 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.9036	108.7980	104.6925	100.5869	96.4813	92.3757	92.3757	96.4813	100.5869	104.6925	108.7980	112.9036 (44)
Energy conte	167.4328	146.4378	151.1107	131.7420	126.4096	109.0818	101.0804	115.9912	117.3765	136.7910	149.3181	162.1497 (45)
Energy content (annual)										Total = Sum(45)m =		1614.9216 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.1149	21.9657	22.6666	19.7613	18.9614	16.3623	15.1621	17.3987	17.6065	20.5186	22.3977	24.3225 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
219.6554 193.6066 203.3333 182.2800 178.6322 159.6198 153.3030 168.2138 167.9145 189.0136 199.8561 214.3723 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	219.6554	193.6066	203.3333	182.2800	178.6322	159.6198	153.3030	168.2138	167.9145	189.0136	199.8561	214.3723 (64)
RHI water heating demand												2229.8006 (64)
Heat gains from water heating, kWh/month	97.4495	86.4256	92.0224	84.2346	83.8093	76.7001	75.3873	80.3452	79.4581	87.2611	90.0787	95.6929 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.1226	57.8413	47.0397	35.6121	26.6205	22.4741	24.2841	31.5654	42.3669	53.7946	62.7862	66.9326 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	435.7638	440.2856	428.8907	404.6322	374.0102	345.2298	326.0027	321.4809	332.8758	357.1343	387.7563	416.5367 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717 (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)	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668 (71)
Water heating gains (Table 5)	130.9805	128.6095	123.6860	116.9925	112.6469	106.5279	101.3270	107.9908	110.3585	117.2864	125.1092	128.6195 (72)
Total internal gains	747.6719	742.5416	715.4215	673.0419	629.0826	590.0369	567.4189	576.8421	601.4063	644.0204	691.4569	727.8938 (73)

6. Solar gains

[Jan]												
Area	m2											
Solar flux	Table 6a											
Specific data	g											
Specific data	or Table 6b											
FF	Specific data											
Access	factor											
Table 6d	Table 6d											
Gains	W											
North	0.5900	13.4684	0.6300	0.7000	0.7700	2.4285 (74)						
East	10.0400	25.1733	0.6300	0.7000	0.7700	77.2405 (76)						
South	5.4000	56.5862	0.6300	0.7000	0.7700	93.3848 (78)						
Southwest	1.4400	45.0642	0.6300	0.7000	0.7700	19.8320 (79)						
West	8.3300	25.1733	0.6300	0.7000	0.7700	64.0850 (80)						
Northwest	1.4400	14.6130	0.6300	0.7000	0.7700	6.4309 (81)						
Solar gains	263.4017	408.8397	628.5743	858.9526	956.6377	1071.5061	984.5976	904.2673	741.8311	505.8682	320.6010	209.4193 (83)
Total gains	1011.0736	1151.3812	1343.9958	1531.9945	1585.7202	1661.5430	1552.0166	1481.1095	1343.2375	1149.8887	1012.0579	937.3131 (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	35.6424	35.8583	35.8583	36.1276	36.0623	36.1915	36.1915	36.2540	36.2540	36.0623	36.1276	36.0623
alpha	3.3762	3.3906	3.3906	3.4085	3.4042	3.4128	3.4128	3.4169	3.4169	3.4042	3.4085	3.4042
util living area	0.9701	0.9541	0.9104	0.8151	0.6728	0.4610	0.3290	0.3336	0.5917	0.8433	0.9458	0.9752 (86)
MIT	19.5211	19.7148	20.0947	20.5294	20.8193	20.9638	20.9917	20.9916	20.9152	20.5634	19.9991	19.4933 (87)
Th 2	19.8609	19.8670	19.8670	19.8745	19.8727	19.8762	19.8762	19.8779	19.8779	19.8727	19.8745	19.8727 (88)
util rest of house	0.9631	0.9437	0.8903	0.7751	0.6044	0.3679	0.2195	0.2193	0.4944	0.7973	0.9310	0.9693 (89)
MIT 2	18.5569	18.7500	19.1148	19.5205	19.7618	19.8621	19.8747	19.8765	19.8388	19.5614	19.0366	18.5390 (90)
Living area fraction									fLA = Living area / (4) =			0.1414 (91)
MIT	18.6933	18.8865	19.2534	19.6632	19.9113	20.0179	20.0326	20.0342	19.9910	19.7031	19.1728	18.6739 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6933	18.8865	19.2534	19.6632	19.9113	20.0179	20.0326	20.0342	19.9910	19.7031	19.1728	18.6739 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	9536	0.9323	0.8772	0.7666	0.6070	0.3800	0.2350	0.2355	0.5049	0.7891	0.9192	0.9608 (94)
Useful gains	964.1936	1073.3997	1178.9503	1174.5022	962.4921	631.4627	364.7841	348.7839	678.2140	907.3999	930.2818	900.5861 (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	2090.7529	2045.3427	1849.6274	1506.5531	1074.9822	647.5714	366.8269	350.7369	720.7343	1199.9442	1665.6004	2047.5766 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

	838.1601	653.1457	498.9838	239.0766	83.6926	0.0000	0.0000	0.0000	0.0000	217.6529	529.4294	853.3609 (98)
Space heating												3913.5022 (98)
RHI space heating demand												3914 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.5200 (1b)	x 2.3800 (2b)	= 151.1776 (1b) - (3b)
First floor	61.7800 (1c)	x 2.6700 (2c)	= 164.9526 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 316.1302 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1582 (8)
Pressure test					Yes
Measured/design AP50					4.5700
Infiltration rate					0.3867 (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) =	0.3287 (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	0.4190	0.4108	0.4026	0.3615	0.3533	0.3122	0.3122	0.3040	0.3287	0.3533	0.3697	0.3862 (22b)
Effective ac	0.5878	0.5844	0.5810	0.5654	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5684	0.5746 (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)			27.2400	1.1450	31.1908		(27)
Ground Floor			63.5200	0.1200	7.6224	84.0000	5335.6800 (28a)
Brick and Block	181.6300	29.3600	152.2700	0.2400	36.5448	42.2200	6428.8394 (29a)
Pitched Roof	63.5200		63.5200	0.1000	6.3520	9.1000	578.0320 (30)
Total net area of external elements Aum(A, m ²)			308.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.0420		(33)
GF Block			57.3300			75.0000	4299.7500 (32c)
GF Stud			32.8200			9.0000	295.3800 (32c)
FF Stud			147.4900			9.0000	1327.4100 (32c)
Internal Floor 1			61.7800			18.0000	1112.0400 (32d)
Internal Ceiling 1			61.7800			18.0000	1112.0400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20489.1714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 163.5209 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.6990 (36)
Total fabric heat loss (33) + (36) = 99.7410 (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	61.3210	60.9653	60.6167	58.9792	58.6728	57.2466	57.2466	56.9825	57.7959	58.6728	59.2926	59.9406 (38)
Heat transfer coeff	161.0620	160.7064	160.3577	158.7202	158.4138	156.9876	156.9876	156.7235	157.5370	158.4138	159.0336	159.6816 (39)
Average = Sum(39)m / 12 =												158.7187 (39)
HLP	1.2854	1.2826	1.2798	1.2667	1.2643	1.2529	1.2529	1.2508	1.2573	1.2643	1.2692	1.2744 (40)
HLP (average)												1.2667 (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												2.8817 (42)
Average daily hot water use (litres/day)												102.6397 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.9036	108.7980	104.6925	100.5869	96.4813	92.3757	92.3757	96.4813	100.5869	104.6925	108.7980	112.9036 (44)
Energy conte	167.4328	146.4378	151.1107	131.7420	126.4096	109.0818	101.0804	115.9912	117.3765	136.7910	149.3181	162.1497 (45)
Energy content (annual)										Total = Sum(45)m =		1614.9216 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.1149	21.9657	22.6666	19.7613	18.9614	16.3623	15.1621	17.3987	17.6065	20.5186	22.3977	24.3225 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
219.6554 193.6066 203.3333 182.2800 178.6322 159.6198 153.3030 168.2138 167.9145 189.0136 199.8561 214.3723 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	219.6554	193.6066	203.3333	182.2800	178.6322	159.6198	153.3030	168.2138	167.9145	189.0136	199.8561	214.3723 (64)
Total per year (kWh/year) = Sum(64)m =												2229.8006 (64)
Heat gains from water heating, kWh/month												
97.4495 86.4256 92.0224 84.2346 83.8093 76.7001 75.3873 80.3452 79.4581 87.2611 90.0787 95.6929 (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	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
65.1226 57.8413 47.0397 35.6121 26.6205 22.4741 24.2841 31.5654 42.3669 53.7946 62.7862 66.9326 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
435.7638 440.2856 428.8907 404.6322 374.0102 345.2298 326.0027 321.4809 332.8758 357.1343 387.7563 416.5367 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.1717 55.1717 55.1717 55.1717 55.1717 55.1717 55.1717 55.1717 55.1717 55.1717 55.1717 55.1717 (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)												
-115.2668 -115.2668 -115.2668 -115.2668 -115.2668 -115.2668 -115.2668 -115.2668 -115.2668 -115.2668 -115.2668 -115.2668 (71)												
Water heating gains (Table 5)												
130.9805 128.6095 123.6860 116.9925 112.6469 106.5279 101.3270 107.9908 110.3585 117.2864 125.1092 128.6195 (72)												
Total internal gains	747.6719	742.5416	715.4215	673.0419	629.0826	590.0369	567.4189	576.8421	601.4063	644.0204	691.4569	727.8938 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.5900	10.6334	0.6300	0.7000	0.7700	1.9173 (74)
East	10.0400	19.6403	0.6300	0.7000	0.7700	60.2633 (76)
South	5.4000	46.7521	0.6300	0.7000	0.7700	77.1554 (78)
Southwest	1.4400	36.7938	0.6300	0.7000	0.7700	16.1923 (79)
West	8.3300	19.6403	0.6300	0.7000	0.7700	49.9993 (80)
Northwest	1.4400	11.2829	0.6300	0.7000	0.7700	4.9654 (81)
Solar gains	210.4931	383.4107	578.3580	786.6582	930.5344	941.6620 900.7172 793.2143 651.8189 439.4316 256.9477 176.8546 (83)
Total gains	958.1651	1125.9522	1293.7795	1459.7001	1559.6169	1531.6989 1468.1362 1370.0564 1253.2252 1083.4520 948.4046 904.7484 (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	35.3369	35.4151	35.4921	35.8583	35.9276	36.2540	36.2540	36.3151	36.1276	35.9276	35.7876	35.6424
alpha	3.3558	3.3610	3.3661	3.3906	3.3952	3.4169	3.4169	3.4210	3.4085	3.3952	3.3858	3.3762
util living area	0.9796	0.9646	0.9332	0.8648	0.7500	0.5927	0.4508	0.4968	0.7154	0.9019	0.9667	0.9830 (86)
MIT	19.2528	19.5010	19.8831	20.3403	20.6956	20.9026	20.9710	20.9594	20.8086	20.3278	19.7040	19.2059 (87)
Th 2	19.8523	19.8545	19.8567	19.8670	19.8689	19.8779	19.8779	19.8796	19.8745	19.8689	19.8650	19.8609 (88)
util rest of house	0.9751	0.9569	0.9184	0.8349	0.6958	0.5084	0.3441	0.3876	0.6376	0.8733	0.9580	0.9791 (89)
MIT 2	18.2852	18.5306	18.9039	19.3438	19.6594	19.8277	19.8685	19.8652	19.7633	19.3453	18.7416	18.2453 (90)
Living area fraction	18.4220	18.6679	19.0424	19.4848	19.8060	19.9797	20.0244	20.0200	19.9111	19.4842	18.8777	0.1414 (91)
MIT	18.4220	18.6679	19.0424	19.4848	19.8060	19.9797	20.0244	20.0200	19.9111	19.4842	18.8777	18.3812 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4220	18.6679	19.0424	19.4848	19.8060	19.9797	20.0244	20.0200	19.9111	19.4842	18.8777	18.3812 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9674 0.9465 0.9054 0.8232 0.6925 0.5165 0.3586 0.4020 0.6404 0.8614 0.9481 0.9724 (94)												
Useful gains	926.9643	1065.6832	1171.4303	1201.6325	1079.9866	791.1478	526.4517	550.7103	802.6066	933.2897	899.1733	879.7608 (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	2274.5207	2212.5841	2011.2666	1680.0177	1284.0973	844.5510	537.5875	567.3312	915.4709	1407.3814	1873.0537	2264.4734 (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	1002.5820	770.7174	624.8382	344.4374	151.8584	0.0000	0.0000	0.0000	0.0000	352.7242	701.1938	1030.2261 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Space heating
Space heating per m2 (98) / (4) = 4978.5776 (98)
39.7333 (99)

8c. Space cooling requirement

Not applicable

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 %) 90.5000 (206)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating requirement 5501.1907 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1002.5820	770.7174	624.8382	344.4374	151.8584	0.0000	0.0000	0.0000	0.0000	352.7242	701.1938	1030.2261 (98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000 (210)
Space heating fuel (main heating system)	1107.8254	851.6214	690.4289	380.5938	167.7993	0.0000	0.0000	0.0000	0.0000	389.7506	774.7998	1138.3714 (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	219.6554	193.6066	203.3333	182.2800	178.6322	159.6198	153.3030	168.2138	167.9145	189.0136	199.8561	214.3723 (64)
Efficiency of water heater (217)m	88.3705	88.1276	87.6156	86.4868	84.3843	79.8000	79.8000	79.8000	79.8000	86.4554	87.8862	79.8000 (216)
Fuel for water heating, kWh/month	248.5619	219.6890	232.0742	210.7605	211.6888	200.0249	192.1090	210.7942	210.4192	218.6256	227.4032	242.3462 (219)
Water heating fuel used												2624.4966 (219)
Annual totals kWh/year												
Space heating fuel - main system												5501.1907 (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)												460.0342 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.17 * 1080 * 1.00) =									-1010.4350			-1010.4350 (233)
Total delivered energy for all uses												7650.2864 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5501.1907	3.4800	191.4414 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2624.4966	3.4800	91.3325 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	460.0342	13.1900	60.6785 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1010.4350	13.1900	-133.2764 (252)
Total energy cost			340.0685 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.4200 (256)
SAP value 0.8387 (257)
SAP rating (Section 12) 88.3003
SAP band 88 (258)
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	5501.1907	0.2160	1188.2572 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2624.4966	0.2160	566.8913 (264)
Space and water heating			1755.1484 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	460.0342	0.5190	238.7577 (268)
Energy saving/generation technologies			
PV Unit	-1010.4350	0.5190	-524.4158 (269)
Total kg/year			1508.4154 (272)
CO2 emissions per m2			12.0400 (273)
EI value			88.1311
EI rating			88 (274)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

EI band

B

Calculation of stars for heating and DHW	

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8475 = 4.106$, stars = 4
Water heating environmental impact	$0.216 / 0.8475 = 0.2549$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.5200 (1b)	x 2.3800 (2b)	= 151.1776 (1b) - (3b)
First floor	61.7800 (1c)	x 2.6700 (2c)	= 164.9526 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 316.1302 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1582 (8)
Pressure test					Yes
Measured/design AP50					4.5700
Infiltration rate					0.3867 (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) =	0.3287 (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	0.3862	0.3615	0.3615	0.3287	0.3369	0.3204	0.3204	0.3122	0.3122	0.3369	0.3287	0.3369 (22b)
Effective ac	0.5746	0.5654	0.5654	0.5540	0.5567	0.5513	0.5513	0.5487	0.5487	0.5567	0.5540	0.5567 (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)			27.2400	1.1450	31.1908		(27)
Ground Floor			63.5200	0.1200	7.6224	84.0000	5335.6800 (28a)
Brick and Block	181.6300	29.3600	152.2700	0.2400	36.5448	42.2200	6428.8394 (29a)
Pitched Roof	63.5200		63.5200	0.1000	6.3520	9.1000	578.0320 (30)
Total net area of external elements Aum(A, m ²)			308.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.0420		(33)
GF Block			57.3300			75.0000	4299.7500 (32c)
GF Stud			32.8200			9.0000	295.3800 (32c)
FF Stud			147.4900			9.0000	1327.4100 (32c)
Internal Floor 1			61.7800			18.0000	1112.0400 (32d)
Internal Ceiling 1			61.7800			18.0000	1112.0400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	20489.1714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							163.5209 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6990 (36)
Total fabric heat loss						(33) + (36) =	99.7410 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	59.9406	58.9792	58.9792	57.7959	58.0812	57.5177	57.5177	57.2466	57.2466	58.0812	57.7959	58.0812 (38)
Average = Sum(39)m / 12 =	159.6816	158.7202	158.7202	157.5370	157.8222	157.2588	157.2588	156.9876	156.9876	157.8222	157.5370	157.8222 (39)
												157.8463 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2744	1.2667	1.2667	1.2573	1.2596	1.2551	1.2551	1.2529	1.2529	1.2596	1.2573	1.2596 (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												2.8817 (42)
Average daily hot water use (litres/day)												102.6397 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.9036	108.7980	104.6925	100.5869	96.4813	92.3757	92.3757	96.4813	100.5869	104.6925	108.7980	112.9036 (44)
Energy conte	167.4328	146.4378	151.1107	131.7420	126.4096	109.0818	101.0804	115.9912	117.3765	136.7910	149.3181	162.1497 (45)
Energy content (annual)										Total = Sum(45)m =		1614.9216 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	25.1149	21.9657	22.6666	19.7613	18.9614	16.3623	15.1621	17.3987	17.6065	20.5186	22.3977	24.3225 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
219.6554 193.6066 203.3333 182.2800 178.6322 159.6198 153.3030 168.2138 167.9145 189.0136 199.8561 214.3723 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	219.6554	193.6066	203.3333	182.2800	178.6322	159.6198	153.3030	168.2138	167.9145	189.0136	199.8561	214.3723 (64)
Total per year (kWh/year) = Sum(64)m =												2229.8006 (64)
Heat gains from water heating, kWh/month	97.4495	86.4256	92.0224	84.2346	83.8093	76.7001	75.3873	80.3452	79.4581	87.2611	90.0787	95.6929 (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	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.1226	57.8413	47.0397	35.6121	26.6205	22.4741	24.2841	31.5654	42.3669	53.7946	62.7862	66.9326 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	435.7638	440.2856	428.8907	404.6322	374.0102	345.2298	326.0027	321.4809	332.8758	357.1343	387.7563	416.5367 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717 (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)	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668 (71)
Water heating gains (Table 5)	130.9805	128.6095	123.6860	116.9925	112.6469	106.5279	101.3270	107.9908	110.3585	117.2864	125.1092	128.6195 (72)
Total internal gains	747.6719	742.5416	715.4215	673.0419	629.0826	590.0369	567.4189	576.8421	601.4063	644.0204	691.4569	727.8938 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	0.5900	13.4684	0.6300	0.7000	0.7700	2.4285 (74)
East	10.0400	25.1733	0.6300	0.7000	0.7700	77.2405 (76)
South	5.4000	56.5862	0.6300	0.7000	0.7700	93.3848 (78)
Southwest	1.4400	45.0642	0.6300	0.7000	0.7700	19.8320 (79)
West	8.3300	25.1733	0.6300	0.7000	0.7700	64.0850 (80)
Northwest	1.4400	14.6130	0.6300	0.7000	0.7700	6.4309 (81)

Solar gains	263.4017	408.8397	628.5743	858.9526	956.6377	1071.5061	984.5976	904.2673	741.8311	505.8682	320.6010	209.4193 (83)
Total gains	1011.0736	1151.3812	1343.9958	1531.9945	1585.7202	1661.5430	1552.0166	1481.1095	1343.2375	1149.8887	1012.0579	937.3131 (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	35.6424	35.8583	35.8583	36.1276	36.0623	36.1915	36.1915	36.2540	36.2540	36.0623	36.1276	36.0623
alpha	3.3762	3.3906	3.3906	3.4085	3.4042	3.4128	3.4128	3.4169	3.4169	3.4042	3.4085	3.4042
util living area	0.9701	0.9541	0.9104	0.8151	0.6728	0.4610	0.3290	0.3336	0.5917	0.8433	0.9458	0.9752 (86)
MIT	19.5211	19.7148	20.0947	20.5294	20.8193	20.9638	20.9917	20.9916	20.9152	20.5634	19.9991	19.4933 (87)
Th 2	19.8609	19.8670	19.8670	19.8745	19.8727	19.8762	19.8762	19.8779	19.8779	19.8727	19.8745	19.8727 (88)
util rest of house	0.9631	0.9437	0.8903	0.7751	0.6044	0.3679	0.2195	0.2193	0.4944	0.7973	0.9310	0.9693 (89)
MIT 2	18.5569	18.7500	19.1148	19.5205	19.7618	19.8621	19.8747	19.8765	19.8388	19.5614	19.0366	18.5390 (90)
Living area fraction									fLA = Living area / (4) =			0.1414 (91)
MIT	18.6933	18.8865	19.2534	19.6632	19.9113	20.0179	20.0326	20.0342	19.9910	19.7031	19.1728	18.6739 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6933	18.8865	19.2534	19.6632	19.9113	20.0179	20.0326	20.0342	19.9910	19.7031	19.1728	18.6739 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	964.1936	1073.3997	1178.9503	1174.5022	962.4921	631.4627	364.7841	348.7839	678.2140	907.3999	930.2818	900.5861 (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	2090.7529	2045.3427	1849.6274	1506.5531	1074.9822	647.5714	366.8269	350.7369	720.7343	1199.9442	1665.6004	2047.5766 (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	838.1601	653.1457	498.9838	239.0766	83.6926	0.0000	0.0000	0.0000	0.0000	217.6529	529.4294	853.3609 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space heating
Space heating per m2 (98) / (4) = 3913.5022 (98)
31.2331 (99)

8c. Space cooling requirement

Not applicable

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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4324.3118 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	838.1601	653.1457	498.9838	239.0766	83.6926	0.0000	0.0000	0.0000	0.0000	217.6529	529.4294	853.3609	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	926.1438	721.7079	551.3633	264.1730	92.4780	0.0000	0.0000	0.0000	0.0000	240.5005	585.0049	942.9403	(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	219.6554	193.6066	203.3333	182.2800	178.6322	159.6198	153.3030	168.2138	167.9145	189.0136	199.8561	214.3723	(64)
Efficiency of water heater (217)m	88.0485	87.8080	87.1181	85.5383	82.9281	79.8000	79.8000	79.8000	79.8000	85.1908	87.2924	88.1275	(216)
Fuel for water heating, kWh/month	249.4710	220.4886	233.3997	213.0975	215.4060	200.0249	192.1090	210.7942	210.4192	221.8709	228.9501	243.2524	(219)
Water heating fuel used												2639.2834	(219)
Annual totals kWh/year													
Space heating fuel - main system												4324.3118	(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)												460.0342	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.17 * 1206 * 1.00) =										-1128.8256		-1128.8256	(233)
Total delivered energy for all uses												6369.8038	(238)

10a. Fuel costs - using BEDF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4324.3118	3.6300	156.9725 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2639.2834	3.6300	95.8060 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	460.0342	19.4400	89.4306 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-1128.8256	19.4400	-219.4437 (252)
Total energy cost			232.3455 (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	4324.3118	0.2160	934.0514 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2639.2834	0.2160	570.0852 (264)
Space and water heating			1504.1366 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	460.0342	0.5190	238.7577 (268)
Energy saving/generation technologies			
PV Unit	-1128.8256	0.5190	-585.8605 (269)
Total kg/year			1195.9588 (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	4324.3118	1.2200	5275.6604 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2639.2834	1.2200	3219.9257 (264)
Space and water heating			8495.5861 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	460.0342	3.0700	1412.3049 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit	-1128.8256	3.0700	-3465.4945 (269)
Primary energy kWh/year			6672.6465 (272)
Primary energy kWh/m ² /year			53.2534 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 88
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	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 40	-271 kg (22.7%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£40 2.16 kg/m ²	B 90	B 90
Total Savings	£40 2.16 kg/m ²		

Potential energy efficiency rating:	B 90
Potential environmental impact rating:	B 90

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 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	£114	-£10
Mains gas	£348	£298	£50
Space heating	£267	£268	-£1
Water heating	£96	£54	£42
Lighting	£89	£89	£0
Generated (PV)	-£219	-£219	£0
Total cost of fuels	£233	£193	£40
Total cost of uses	£233	£192	£41
Delivered energy	51 kWh/m ²	40 kWh/m ²	11 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	0.9 tonnes	0.3 tonnes
CO2 emissions per m ²	10 kg/m ²	7 kg/m ²	2 kg/m ²
Primary energy	53 kWh/m ²	41 kWh/m ²	12 kWh/m ²

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.5200 (1b)	x 2.3800 (2b)	= 151.1776 (1b) - (3b)
First floor	61.7800 (1c)	x 2.6700 (2c)	= 164.9526 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 316.1302 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1582 (8)
Pressure test					Yes
Measured/design AP50					4.5700
Infiltration rate					0.3867 (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) =	0.3287 (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	0.4190	0.4108	0.4026	0.3615	0.3533	0.3122	0.3122	0.3040	0.3287	0.3533	0.3697	0.3862 (22b)
Effective ac	0.5878	0.5844	0.5810	0.5654	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5684	0.5746 (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)			27.2400	1.1450	31.1908		(27)
Ground Floor			63.5200	0.1200	7.6224	84.0000	5335.6800 (28a)
Brick and Block	181.6300	29.3600	152.2700	0.2400	36.5448	42.2200	6428.8394 (29a)
Pitched Roof	63.5200		63.5200	0.1000	6.3520	9.1000	578.0320 (30)
Total net area of external elements Aum(A, m ²)			308.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.0420		(33)
GF Block			57.3300			75.0000	4299.7500 (32c)
GF Stud			32.8200			9.0000	295.3800 (32c)
FF Stud			147.4900			9.0000	1327.4100 (32c)
Internal Floor 1			61.7800			18.0000	1112.0400 (32d)
Internal Ceiling 1			61.7800			18.0000	1112.0400 (32e)

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

(28)...(30) + (32) + (32a)...(32e) =	20489.1714 (34)
	163.5209 (35)
	15.6990 (36)
(33) + (36) =	99.7410 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 61.3210 Feb 60.9653 Mar 60.6167 Apr 58.9792 May 58.6728 Jun 57.2466 Jul 57.2466 Aug 56.9825 Sep 57.7959 Oct 58.6728 Nov 59.2926 Dec 59.9406 (38)
Heat transfer coeff	161.0620 160.7064 160.3577 158.7202 158.4138 156.9876 156.9876 156.7235 157.5370 158.4138 159.0336 159.6816 (39)
Average = Sum(39)m / 12 =	158.7187 (39)

HLP	Jan 1.2854 Feb 1.2826 Mar 1.2798 Apr 1.2667 May 1.2643 Jun 1.2529 Jul 1.2529 Aug 1.2508 Sep 1.2573 Oct 1.2643 Nov 1.2692 Dec 1.2744 (40)
HLP (average)	1.2667 (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												2.8817 (42)
Average daily hot water use (litres/day)												102.6397 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.9036	108.7980	104.6925	100.5869	96.4813	92.3757	92.3757	96.4813	100.5869	104.6925	108.7980	112.9036 (44)
Energy conte	167.4328	146.4378	151.1107	131.7420	126.4096	109.0818	101.0804	115.9912	117.3765	136.7910	149.3181	162.1497 (45)
Energy content (annual)	Total = Sum(45)m =											1614.9216 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.1149	21.9657	22.6666	19.7613	18.9614	16.3623	15.1621	17.3987	17.6065	20.5186	22.3977	24.3225 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
18.8578 17.0329 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 (57)												
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
209.5530 184.4819 191.8352 165.7499 155.7354 137.2366 130.1736 146.0149 152.7351 177.5155 190.0795 204.2700 (62)												
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.1230 (H8)
Utilisation factor												0.5895 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												102.6397 (H14)
Volume ratio Veff/V												1.1399 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-940.1148 (H17)
Solar input	-27.2615	-45.4915	-77.4773	-103.8348	-128.2792	-126.1189	-124.4522	-108.7345	-85.1609	-58.1549	-32.3360	-22.8132 (63)
Solar input (sum of months) = Sum (63)m =												-940.1148 (63)
Output from w/h												
182.2916 138.9903 114.3579 61.9150 27.4563 11.1177 5.7215 37.2805 67.5742 119.3606 157.7435 181.4568 (64)												
Total per year (kWh/year) = Sum (64)m =												1105.2658 (64)
Heat gains from water heating, kWh/month												
89.3676 79.1258 82.8239 71.0105 65.4919 58.7935 56.8838 62.5861 67.3146 78.0626 82.2574 87.6110 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002 (66)
65.1226 57.8413 47.0397 35.6121 26.6205 22.4741 24.2841 31.5654 42.3669 53.7946 62.7862 66.9326 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	435.7638	440.2856	428.8907	404.6322	374.0102	345.2298	326.0027	321.4809	332.8758	357.1343	387.7563	416.5367 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717 (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)	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668 (71)
Water heating gains (Table 5)	120.1177	117.7468	111.3224	98.6257	88.0267	81.6577	76.4568	84.1211	93.4925	104.9228	114.2465	117.7567 (72)
Total internal gains	736.8092	731.6788	703.0579	654.6751	604.4624	565.1667	542.5487	552.9724	584.5403	631.6568	680.5941	717.0310 (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	
North					0.5900	10.6334	0.6300	0.7000	0.7700		1.9173 (74)	
East					10.0400	19.6403	0.6300	0.7000	0.7700		60.2633 (76)	
South					5.4000	46.7521	0.6300	0.7000	0.7700		77.1554 (78)	
Southwest					1.4400	36.7938	0.6300	0.7000	0.7700		16.1923 (79)	
West					8.3300	19.6403	0.6300	0.7000	0.7700		49.9993 (80)	
Northwest					1.4400	11.2829	0.6300	0.7000	0.7700		4.9654 (81)	
Solar gains	210.4931	383.4107	578.3580	786.6582	930.5344	941.6620	900.7172	793.2143	651.8189	439.4316	256.9477	176.8546 (83)
Total gains	947.3023	1115.0894	1281.4159	1441.3333	1534.9968	1506.8286	1443.2659	1346.1867	1236.3592	1071.0884	937.5418	893.8857 (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	35.3369	35.4151	35.4921	35.8583	35.9276	36.2540	36.2540	36.3151	36.1276	35.9276	35.7876	35.6424
util living area	3.3558	3.3610	3.3661	3.3906	3.3952	3.4169	3.4169	3.4210	3.4085	3.3952	3.3858	3.3762
0.9803 0.9655 0.9348 0.8684 0.7564 0.6000 0.4577 0.5042 0.7211 0.9045 0.9677 0.9836 (86)												
MIT	19.2428	19.4916	19.8736	20.3296	20.6869	20.8988	20.9696	20.9575	20.8036	20.3193	19.6945	19.1957 (87)
Th 2	19.8523	19.8545	19.8567	19.8670	19.8689	19.8779	19.8779	19.8796	19.8745	19.8689	19.8650	19.8609 (88)
util rest of house												
0.9759 0.9579 0.9203 0.8390 0.7026 0.5153 0.3497 0.3939 0.6436 0.8764 0.9593 0.9798 (89)												
MIT 2	18.2753	18.5215	18.8949	19.3344	19.6528	19.8256	19.8680	19.8645	19.7600	19.3378	18.7324	18.2353 (90)
Living area fraction												0.1414 (91)
fLA = Living area / (4) =												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

MIT	18.4122	18.6587	19.0333	19.4751	19.7990	19.9774	20.0238	20.0191	19.9076	19.4766	18.8684	18.3712 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4122	18.6587	19.0333	19.4751	19.7990	19.9774	20.0238	20.0191	19.9076	19.4766	18.8684	18.3712 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9684	0.9477	0.9074	0.8271	0.6990	0.5234	0.3643	0.4084	0.6462	0.8645	0.9495	0.9732 (94)
Useful gains	917.3453	1056.7712	1162.6996	1192.1866	1072.8919	788.6116	525.8017	549.7483	798.9156	925.9059	890.2132	869.9705 (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												
	2272.9341	2211.1058	2009.8152	1678.4820	1282.9962	844.1799	537.4923	567.1909	914.9104	1406.1721	1871.5791	2262.8722 (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												
	1008.5581	775.7129	630.2540	350.1327	156.3176	0.0000	0.0000	0.0000	0.0000	357.3181	706.5835	1036.3189 (98)
Space heating												5021.1957 (98)
Space heating per m2												(98) / (4) = 40.0734 (99)

8c. Space cooling requirement

Not applicable

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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5548.2825 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1008.5581	775.7129	630.2540	350.1327	156.3176	0.0000	0.0000	0.0000	0.0000	357.3181	706.5835	1036.3189 (98)	
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000 (210)	
Space heating fuel (main heating system)	1114.4288	857.1413	696.4133	386.8870	172.7266	0.0000	0.0000	0.0000	0.0000	394.8266	780.7553	1145.1037 (211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement	182.2916	138.9903	114.3579	61.9150	27.4563	11.1177	5.7215	37.2805	67.5742	119.3606	157.7435	181.4568 (64)	
Efficiency of water heater (217)m	88.6798	88.6929	88.6739	88.7126	88.7226	79.8000	79.8000	79.8000	79.8000	87.5602	88.3383	88.7273 (217)	
Fuel for water heating, kWh/month	205.5615	156.7096	128.9645	69.7928	30.9462	13.9320	7.1697	46.7174	84.6794	136.3184	178.5676	204.5107 (219)	
Water heating fuel used												1263.8698 (219)	
Annual totals kWh/year													
Space heating fuel - main system												5548.2825 (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)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													460.0342 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.17 * 1080 * 1.00) =										-1010.4350		-1010.4350 (233)	
Total delivered energy for all uses												6386.7515 (238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5548.2825	3.4800	193.0802 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	1263.8698	3.4800	43.9827 (247)	
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)	
Pump for solar water heating	50.0000	13.1900	6.5950 (249)	
Energy for lighting	460.0342	13.1900	60.6785 (250)	
Additional standing charges			120.0000 (251)	
Energy saving/generation technologies				
PV Unit	-1010.4350	13.1900	-133.2764 (252)	
Total energy cost			300.9525 (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] =	0.7422 (257)
SAP value		89.6460
SAP rating (Section 12)		90 (258)
SAP band		B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	5548.2825	0.2160	1198.4290 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1263.8698	0.2160	272.9959 (264)
Space and water heating			1471.4249 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	460.0342	0.5190	238.7577 (268)
Energy saving/generation technologies			
PV Unit	-1010.4350	0.5190	-524.4158 (269)
Total kg/year			1250.6419 (272)
CO2 emissions per m2			9.9800 (273)
EI value			90.1594
EI rating			90 (274)
EI band			B

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.5200 (1b)	x 2.3800 (2b)	= 151.1776 (1b) - (3b)
First floor	61.7800 (1c)	x 2.6700 (2c)	= 164.9526 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 316.1302 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1582 (8)
Pressure test					Yes
Measured/design AP50					4.5700
Infiltration rate					0.3867 (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) =	0.3287 (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	0.3862	0.3615	0.3615	0.3287	0.3369	0.3204	0.3204	0.3122	0.3122	0.3369	0.3287	0.3369 (22b)
Effective ac	0.5746	0.5654	0.5654	0.5540	0.5567	0.5513	0.5513	0.5487	0.5487	0.5567	0.5540	0.5567 (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)			27.2400	1.1450	31.1908		(27)
Ground Floor			63.5200	0.1200	7.6224	84.0000	5335.6800 (28a)
Brick and Block	181.6300	29.3600	152.2700	0.2400	36.5448	42.2200	6428.8394 (29a)
Pitched Roof	63.5200		63.5200	0.1000	6.3520	9.1000	578.0320 (30)
Total net area of external elements Aum(A, m ²)			308.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.0420		(33)
GF Block			57.3300			75.0000	4299.7500 (32c)
GF Stud			32.8200			9.0000	295.3800 (32c)
FF Stud			147.4900			9.0000	1327.4100 (32c)
Internal Floor 1			61.7800			18.0000	1112.0400 (32d)
Internal Ceiling 1			61.7800			18.0000	1112.0400 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		20489.1714 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							163.5209 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6990 (36)
Total fabric heat loss						(33) + (36) =	99.7410 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	59.9406	58.9792	58.9792	57.7959	58.0812	57.5177	57.5177	57.2466	57.2466	58.0812	57.7959	58.0812 (38)
Average = Sum(39)m / 12 =	159.6816	158.7202	158.7202	157.5370	157.8222	157.2588	157.2588	156.9876	156.9876	157.8222	157.5370	157.8222 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2744	1.2667	1.2667	1.2573	1.2596	1.2551	1.2551	1.2529	1.2529	1.2596	1.2573	1.2596 (40)
HLP (average)												1.2597 (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												2.8817 (42)
Average daily hot water use (litres/day)												102.6397 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.9036	108.7980	104.6925	100.5869	96.4813	92.3757	92.3757	96.4813	100.5869	104.6925	108.7980	112.9036 (44)
Energy conte	167.4328	146.4378	151.1107	131.7420	126.4096	109.0818	101.0804	115.9912	117.3765	136.7910	149.3181	162.1497 (45)
Energy content (annual)										Total = Sum(45)m =		1614.9216 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	25.1149	21.9657	22.6666	19.7613	18.9614	16.3623	15.1621	17.3987	17.6065	20.5186	22.3977	24.3225 (46)
Water storage loss:												
Store volume												215.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9342 (55)
Total storage loss												
28.9602 26.1576 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 28.0260 28.9602 28.0260 28.9602 28.9602 (56)												
If cylinder contains dedicated solar storage												
18.8578 17.0329 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 18.2495 18.8578 (57)												
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	209.5530	184.4819	191.8352	165.7499	155.7354	137.2366	130.1736	146.0149	152.7351	177.5155	190.0795	204.2700 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1206.0102 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2026.0972 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2546 (H8)
Utilisation factor												0.5493 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												117.0000 (H13)
Daily hot water demand												102.6397 (H14)
Volume ratio Veff/V												1.1399 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-978.6825 (H17)
Solar input	-31.9357	-45.4161	-78.8086	-106.0109	-123.1918	-133.9969	-127.0495	-115.8569	-90.6809	-62.6754	-37.7726	-25.2871 (63)
Solar input (sum of months) = Sum (63)m =												-978.6825 (63)
Output from w/h	177.6174	139.0658	113.0266	59.7390	32.5436	3.2397	3.1241	30.1581	62.0542	114.8401	152.3069	178.9828 (64)
Total per year (kWh/year) = Sum (64)m =												1066.6982 (64)
Heat gains from water heating, kWh/month	89.3676	79.1258	82.8239	71.0105	65.4919	58.7935	56.8838	62.5861	67.3146	78.0626	82.2574	87.6110 (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	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	172.9002	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.1226	57.8413	47.0397	35.6121	26.6205	22.4741	24.2841	31.5654	42.3669	53.7946	62.7862	66.9326	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	435.7638	440.2856	428.8907	404.6322	374.0102	345.2298	326.0027	321.4809	332.8758	357.1343	387.7563	416.5367	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	55.1717	(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)	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	-115.2668	(71)
Water heating gains (Table 5)	120.1177	117.7468	111.3224	98.6257	88.0267	81.6577	76.4568	84.1211	93.4925	104.9228	114.2465	117.7567	(72)
Total internal gains	736.8092	731.6788	703.0579	654.6751	604.4624	565.1667	542.5487	552.9724	584.5403	631.6568	680.5941	717.0310	(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	
North					0.5900	13.4684		0.6300	0.7000	0.7700		2.4285 (74)	
East					10.0400	25.1733		0.6300	0.7000	0.7700		77.2405 (76)	
South					5.4000	56.5862		0.6300	0.7000	0.7700		93.3848 (78)	
Southwest					1.4400	45.0642		0.6300	0.7000	0.7700		19.8320 (79)	
West					8.3300	25.1733		0.6300	0.7000	0.7700		64.0850 (80)	
Northwest					1.4400	14.6130		0.6300	0.7000	0.7700		6.4309 (81)	
Solar gains	263.4017	408.8397	628.5743	858.9526	956.6377	1071.5061	984.5976	904.2673	741.8311	505.8682	320.6010	209.4193	(83)
Total gains	1000.2108	1140.5184	1331.6322	1513.6277	1561.1001	1636.6727	1527.1463	1457.2397	1326.3715	1137.5251	1001.1951	926.4503	(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	35.6424	35.8583	35.8583	36.1276	36.0623	36.1915	36.1915	36.2540	36.2540	36.0623	36.1276	36.0623	
alpha	3.3762	3.3906	3.3906	3.4085	3.4042	3.4128	3.4128	3.4169	3.4169	3.4042	3.4085	3.4042	
util living area	0.9710	0.9553	0.9124	0.8193	0.6796	0.4671	0.3341	0.3387	0.5973	0.8467	0.9473	0.9760	(86)
MIT	19.5114	19.7057	20.0860	20.5207	20.8134	20.9623	20.9913	20.9912	20.9127	20.5567	19.9903	19.4834	(87)
Th 2	19.8609	19.8670	19.8670	19.8745	19.8727	19.8762	19.8762	19.8779	19.8779	19.8727	19.8745	19.8727	(88)
util rest of house	0.9642	0.9451	0.8926	0.7798	0.6114	0.3731	0.2230	0.2228	0.4997	0.8012	0.9328	0.9702	(89)
MIT 2	18.5475	18.7413	19.1068	19.5132	19.7578	19.8614	19.8746	19.8764	19.8375	19.5560	19.0283	18.5293	(90)
Living area fraction													fLA = Living area / (4) = 0.1414 (91)

MIT	18.6838	18.8777	19.2453	19.6557	19.9071	20.0171	20.0325	20.0340	19.9896	19.6976	19.1644	18.6643 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6838	18.8777	19.2453	19.6557	19.9071	20.0171	20.0325	20.0340	19.9896	19.6976	19.1644	18.6643 (93)

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4364.9270	0.2160	942.8242 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1222.9718	0.2160	264.1619 (264)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space and water heating			1206.9861 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	460.0342	0.5190	238.7577 (268)
Energy saving/generation technologies			
PV Unit	-1128.8256	0.5190	-585.8605 (269)
Total kg/year			924.7584 (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	4364.9270	1.2200	5325.2109 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1222.9718	1.2200	1492.0256 (264)
Space and water heating			6817.2365 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	460.0342	3.0700	1412.3049 (268)
Energy saving/generation technologies			
PV Unit	-1128.8256	3.0700	-3465.4945 (269)
Primary energy kWh/year			5147.7969 (272)
Primary energy kWh/m2/year			41.0838 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 77	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Project	20 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.48	TER	16.69
Environmental	88 B	% DER<TER	19.22		
CO ₂ Emissions (t/year)	1.20	DFEE	49.86	TREE	57.46
General Requirements Compliance	Pass	% DFEE<TFEE	13.23		

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 Plot 77	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Project	20 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.48	TER	16.69
Environmental	88 B	% DER<TER	19.22		
CO ₂ Emissions (t/year)	1.20	DFEE	49.86	TFEE	57.46
General Requirements Compliance	Pass	% DFEE<TFEE	13.23		

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

Client	Foreman Homes, FORE
--------	---------------------

Building Elements

Wall 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	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Supabloc						
	Main construction	100	0.1100	0.9091	94.04	460	1000
	Main construction	100	0.8803	0.1136	5.96	460	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 = 4.321 m ² K/W	Lower limit = 4.110 m ² K/W	Average = 4.215 m ² K/W
	Total correction = 0.0002 m ² K/W	U-value (unrounded) = 0.24 W/m ² K	

Unheated space: None		
Total thickness: 330 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 77	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Project	20 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.48	TER	16.69
Environmental	88 B	% DER<TER	19.22		
CO ₂ Emissions (t/year)	1.20	DFEE	49.86	TFEE	57.46
General Requirements Compliance	Pass	% DFEE<TFEE	13.23		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 63.52 m², Perimeter = 37.15 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 Plot 77	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Property	20 Haines Crescent, West End, Southampton, SO30 3LG		
SAP Rating	88 B	DER	13.48
Environmental	88 B	TER	16.69
CO ₂ Emissions (t/year)	1.20	% DER<TER	19.22
General Requirements Compliance	Pass	DLEE	49.86
		TFEE	57.46
		% DLEE<TFEE	13.23
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	West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	37.15 m	63.52 m ²	2.38 m
	1st Storey:	34.91 m	61.78 m ²	2.67 m

7.0 Living Area	17.72	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	163.52	kJ/m ² K

9.0 External Walls							
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)	
Brick and Block	Cavity Wall	Other	0.24	42.22	181.63	152.27	

9.1 Party Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
		Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill		70.00		

9.2 Internal Walls					
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)	
GF Block	Dense block, plasterboard on dabs		75.00	57.33	
GF Stud	Plasterboard on timber frame		9.00	32.82	
FF Stud	Plasterboard on timber frame		9.00	147.49	

10.0 External Roofs						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Roof	External Plane Roof	Other	0.10	9.10	63.52	63.52

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	61.78

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	63.52

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	61.78

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	West							2.12	
Front Elevation	Window	[1] Brick and Block	West	None	0.00					8.33	
Side Elevation	Window	[1] Brick and Block	South	None	0.00					5.40	
Rear Elevation	Window	[1] Brick and Block	East	None	0.00					10.04	
Bay	Window	[1] Brick and Block	South West	None	0.00					1.44	
Bay	Window	[1] Brick and Block	North West	None	0.00					1.44	
Side Elevation	Window	[1] Brick and Block	North	None	0.00					0.59	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.65	0.077	No	Birtley Supatherm
Table K1 - Default	E2 Other lintels (including other steel lintels)	4.62	1.000	No	
Independently assessed	E2 Other lintels (including other steel lintels)	0.91	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	8.40	0.067	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.02	0.070	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	4.14	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	18.13	0.021	No	Knauf P5
Independently assessed	E4 Jamb	42.00	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	37.15	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	34.91	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	19.43	0.060	No	
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	3.58	0.240	No	
Independently assessed	E12 Gable (insulation at ceiling level)	14.88	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	34.79	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	14.59	-0.091	No	Knauf P24

Y-value W/m²K

18.0 Pressure Testing

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?	Yes	
As Built AP ₅₀	4.57	m ³ /(h.m ²) @ 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	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
---------------------------------------	----

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				5
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	26	
Total number of L.E.L. fittings	26	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	18911	
Fuel Type	Mains gas	
Main Heating	BGB	
SAP Code	102	
In Winter	90.5	
In Summer	79.8	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

Cylinder Stat

Cylinder In Heated Space

Independent Time Control

Insulation Type

Cylinder Volume L

Loss kWh/day

Pipes insulation

31.0 Thermal Store

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.17	South	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£40	B 90	