



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 19 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 78	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Property	19 Haines Crescent, West End, Southampton, SO30 3LG		
SAP Rating	88 B	DER	13.44
Environmental	88 B	% DER<TER	19.54
CO ₂ Emissions (t/year)	1.19	DFEE	49.69
General Requirements Compliance	Pass	% DFEE<TFEE	13.66
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)	16.70	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.44	kgCO ₂ /m ²	Pass
	-3.26 (-19.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.55	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	49.69	kWh/m ² /yr	
	-7.9 (-13.7%)	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	4.31 (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

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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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

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THERMAL BRIDGING

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SAP Rating	88 B	DER	13.44
Environmental	88 B	TER	16.70
CO ₂ Emissions (t/year)	1.19	% DER<TER	19.54
General Requirements Compliance	Pass	DFEE	49.69
		TFEE	57.55
		% DFEE<TFEE	13.66
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	0.044	14.88	0.65	Knauf P21
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: **15.55** W/mK:
Y-Value: **0.050** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Environmental	88 B	% DER<TER	19.54		
CO ₂ Emissions (t/year)	1.19	DFEE	49.69	TFEE	57.55
General Requirements Compliance	Pass	% DFEE<TFEE	13.66		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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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) 16.70 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.44 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)49.7 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:	4.31 (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 m ² , No overhang
Windows facing East:	10.04 m ² , No overhang
Windows facing South:	5.40 m ² , No overhang
Windows facing South West:	1.44 m ² , No overhang
Windows facing West:	8.33 m ² , No overhang
Windows facing North West:	1.44 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

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

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 2.3900 (2b)	= 151.8128 (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)	= 316.7654 (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) = 0.1578 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3733 (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) =				0.3173 (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	0.4046	0.3967	0.3887	0.3491	0.3411	0.3015	0.3015	0.2935	0.3173	0.3411	0.3570	0.3729 (22b)
Effective ac	0.5819	0.5787	0.5756	0.5609	0.5582	0.5454	0.5454	0.5431	0.5504	0.5582	0.5637	0.5695 (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	182.0000	29.3600	152.6400	0.2400	36.6336	42.2200	6444.4608 (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)			309.0400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.1308		(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) = 20504.7928 (34)
163.6456 (35)
15.5502 (36)
(33) + (36) = 99.6810 (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	60.8229	60.4906	60.1650	58.6352	58.3490	57.0167	57.0167	56.7699	57.5299	58.3490	58.9280	59.5333 (38)
Heat transfer coeff	160.5039	160.1717	159.8460	158.3163	158.0300	156.6977	156.6977	156.4510	157.2109	158.0300	158.6090	159.2144 (39)
Average = Sum(39)m / 12 =												158.3149 (39)
HLP	1.2810	1.2783	1.2757	1.2635	1.2612	1.2506	1.2506	1.2486	1.2547	1.2612	1.2658	1.2707 (40)
HLP (average)												1.2635 (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

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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)													
tau	35.4868	35.5604	35.6329	35.9772	36.0424	36.3488	36.3488	36.4061	36.2302	36.0424	35.9108	35.7743	
alpha	3.3658	3.3707	3.3755	3.3985	3.4028	3.4233	3.4233	3.4271	3.4153	3.4028	3.3941	3.3850	
util living area	0.9909	0.9811	0.9582	0.9024	0.7982	0.6459	0.5003	0.5538	0.7783	0.9396	0.9838	0.9927 (86)	
MIT	19.0449	19.3054	19.7152	20.2178	20.6257	20.8734	20.9604	20.9437	20.7479	20.1871	19.5166	18.9992 (87)	
Th 2	19.8558	19.8579	19.8599	19.8695	19.8713	19.8797	19.8797	19.8813	19.8765	19.8713	19.8677	19.8639 (88)	
util rest of house	0.9887	0.9767	0.9482	0.8784	0.7484	0.5602	0.3854	0.4373	0.7059	0.9197	0.9792	0.9910 (89)	
MIT 2	18.0825	18.3420	18.7464	19.2365	19.6073	19.8126	19.8665	19.8606	19.7239	19.2197	18.5609	18.0429 (90)	
Living area fraction													
MIT	18.2186	18.4783	18.8834	19.3752	19.7513	19.9626	20.0212	20.0138	19.8687	19.3565	18.6961	18.1781 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.2186	18.4783	18.8834	19.3752	19.7513	19.9626	20.0212	20.0138	19.8687	19.3565	18.6961	18.1781 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9844 0.9695 0.9371 0.8658 0.7424 0.5671 0.4006 0.4521 0.7053 0.9080 0.9727 0.9873 (94)													
Useful gains	717.3116	871.9063	1009.6986	1089.3104	1019.8113	769.9117	520.5790	541.7852	755.6394	805.1902	716.0952	671.9425 (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	2233.9893	2174.8528	1979.4440	1658.4007	1272.3459	840.3112	536.0913	565.3843	906.9072	1383.7928	1839.2419	2225.5197 (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	1128.4082	875.5800	721.4906	409.7451	187.8857	0.0000	0.0000	0.0000	0.0000	430.4803	808.6656	1155.8615 (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) = 5718.1169 (98)
45.6354 (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													6318.3613 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1128.4082	875.5800	721.4906	409.7451	187.8857	0.0000	0.0000	0.0000	0.0000	430.4803	808.6656	1155.8615	(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)	1246.8599	967.4917	797.2271	452.7570	207.6085	0.0000	0.0000	0.0000	0.0000	475.6689	893.5532	1277.1950	(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	88.5650	88.3548	87.9084	86.9119	84.9486	79.8000	79.8000	79.8000	79.8000	86.9431	88.1575	88.6405	(216)
Fuel for water heating, kWh/month	248.0160	219.1242	231.3012	209.7295	210.2826	200.0249	192.1090	210.7942	210.4192	217.3992	226.7033	241.8446	(219)
Water heating fuel used												2617.7478	(219)
Annual totals kWh/year													
Space heating fuel - main system												6318.3613	(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												8460.7082	(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	6318.3613	0.2160	1364.7660	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2617.7478	0.2160	565.4335	(264)
Space and water heating			1930.1996	(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			1683.4665	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.4400	(273)

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

DER	13.4400	ZC1
Total Floor Area	125.3000	TFA
Assumed number of occupants	2.8817	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	13.8077	ZC2
CO2 emissions from cooking, equation (L16)	1.5017	ZC3
Total CO2 emissions	28.7494	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	28.7494	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 2.3900 (2b)	= 151.8128 (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)	= 316.7654 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							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) =	0.1263 (8)				
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.3763 (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) =	0.3198 (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	0.4078	0.3998	0.3918	0.3518	0.3438	0.3038	0.3038	0.2958	0.3198	0.3438	0.3598	0.3758 (22b)
Effective ac	0.5831	0.5799	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5511	0.5591	0.5647	0.5706 (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	182.0000	29.3600	152.6400	0.1800	27.4752		(29a)					
Pitched Roof	63.5200		63.5200	0.1300	8.2576		(30)					
Total net area of external elements Aum(A, m2)			309.0400				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.2240		(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) =	97.0478 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 60.9578	Feb 60.6203	Mar 60.2895	Apr 58.7356	May 58.4449	Jun 57.0916	Jul 57.0916	Aug 56.8409	Sep 57.6128	Oct 58.4449	Nov 59.0330	Dec 59.6479 (38)
Heat transfer coeff	158.0056	157.6681	157.3373	155.7835	155.4927	154.1394	154.1394	153.8888	154.6607	155.4927	156.0809	156.6957 (39)
Average = Sum(39)m / 12 =												155.7821 (39)
HLP	Jan 1.2610	Feb 1.2583	Mar 1.2557	Apr 1.2433	May 1.2410	Jun 1.2302	Jul 1.2302	Aug 1.2282	Sep 1.2343	Oct 1.2410	Nov 1.2457	Dec 1.2506 (40)
HLP (average)												1.2433 (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												
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	55.0701	55.1880	55.3040	55.8557	55.9601	56.4514	56.4514	56.5434	56.2612	55.9601	55.7492	55.5305
alpha	4.6713	4.6792	4.6869	4.7237	4.7307	4.7634	4.7634	4.7696	4.7507	4.7307	4.7166	4.7020
util living area	0.9982	0.9950	0.9841	0.9453	0.8460	0.6750	0.5104	0.5701	0.8245	0.9728	0.9960	0.9987 (86)
MIT	19.5958	19.7918	20.1020	20.4873	20.7906	20.9483	20.9889	20.9817	20.8643	20.4437	19.9418	19.5626 (87)
Th 2	19.8715	19.8736	19.8757	19.8855	19.8874	19.8959	19.8959	19.8975	19.8926	19.8874	19.8836	19.8798 (88)
util rest of house	0.9976	0.9932	0.9784	0.9252	0.7927	0.5788	0.3883	0.4436	0.7451	0.9591	0.9943	0.9983 (89)
MIT 2	18.0062	18.2936	18.7443	19.2948	19.6885	19.8630	19.8921	19.8904	19.7871	19.2462	18.5205	17.9634 (90)
Living area fraction	18.2310	18.5055	18.9363	19.4634	19.8443	20.0165	20.0472	20.0447	19.9394	19.4155	18.7215	18.1895 (91)
MIT	18.2310	18.5055	18.9363	19.4634	19.8443	20.0165	20.0472	20.0447	19.9394	19.4155	18.7215	18.1895 (92)
Temperature adjustment	18.2310	18.5055	18.9363	19.4634	19.8443	20.0165	20.0472	20.0447	19.9394	19.4155	18.7215	18.1895 (93)
adjusted MIT	18.2310	18.5055	18.9363	19.4634	19.8443	20.0165	20.0472	20.0447	19.9394	19.4155	18.7215	18.1895 (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	0.9156	0.7904	0.5901	0.4055	0.4613	0.7490	0.9510	0.9915	0.9972	(94)
Ext temp.	725.8421	890.2942	1046.8051	1151.9632	1085.6220	801.1209	526.8884	552.8020	802.4151	843.2125	729.8649	678.5567	(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	2201.1749	2145.1493	1956.6960	1645.6045	1266.3826	834.8889	531.3523	560.8858	903.1254	1370.7533	1813.8882	2192.0991	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m ²	1097.6476	843.2626	676.9588	355.4217	134.4859	0.0000	0.0000	0.0000	0.0000	392.4904	780.4968	1126.0755	(98)
Space heating												5406.8393	(98)
Space heating per m ²												43.1512	(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

5782.7158 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1097.6476	843.2626	676.9588	355.4217	134.4859	0.0000	0.0000	0.0000	0.0000	392.4904	780.4968	1126.0755	(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)	1173.9547	901.8852	724.0201	380.1302	143.8351	0.0000	0.0000	0.0000	0.0000	419.7758	834.7559	1204.3588	(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	88.5214	88.2901	87.7820	86.5661	84.0702	79.8000	79.8000	79.8000	79.8000	86.7213	88.0927	88.6006	(216)
Fuel for water heating, kWh/month	248.0585	219.2123	231.5540	210.4883	212.3958	199.9392	192.0204	210.7057	210.3335	217.8736	226.7927	241.8739	(219)
Water heating fuel used												2621.2480	(219)
Annual totals kWh/year													
Space heating fuel - main system												5782.7158	(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												8938.9980	(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	5782.7158	0.2160	1249.0666 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2621.2480	0.2160	566.1896 (264)
Space and water heating			1815.2562 (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			2092.9389 (272)
Emissions per m2 for space and water heating			14.4873 (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) = (14.4873 * 1.00) + 1.9055 + 0.3107, rounded to 2 d.p.			16.7000 (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 2.3900 (2b)	= 151.8128 (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)	= 316.7654 (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) = 0.1263 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3418 (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) =	0.2905 (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	0.3704	0.3631	0.3559	0.3196	0.3123	0.2760	0.2760	0.2687	0.2905	0.3123	0.3268	0.3413 (22b)
Effective ac	0.5686	0.5659	0.5633	0.5511	0.5488	0.5381	0.5381	0.5361	0.5422	0.5488	0.5534	0.5583 (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	182.0000	29.3600	152.6400	0.2400	36.6336	42.2200	6444.4608 (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)			309.0400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.1308		(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) (28)...(30) + (32) + (32a)...(32e) = 19948.7728 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 159.2081 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.5502 (36)
Total fabric heat loss (33) + (36) = 99.6810 (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	59.4370	59.1586	58.8856	57.6037	57.3638	56.2473	56.2473	56.0405	56.6774	57.3638	57.8490	58.3563 (38)
Heat transfer coeff	159.1181	158.8396	158.5667	157.2847	157.0449	155.9283	155.9283	155.7215	156.3584	157.0449	157.5301	158.0374 (39)
Average = Sum(39)m / 12 =												157.2836 (39)
HLP	1.2699	1.2677	1.2655	1.2553	1.2534	1.2444	1.2444	1.2428	1.2479	1.2534	1.2572	1.2613 (40)
HLP (average)												1.2553 (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)

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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	34.8252	34.8863	34.9463	35.2312	35.2850	35.5377	35.5377	35.5848	35.4399	35.2850	35.1763	35.0634	
alpha	3.3217	3.3258	3.3298	3.3487	3.3523	3.3692	3.3692	3.3723	3.3627	3.3523	3.3451	3.3376	
util living area	0.9932	0.9847	0.9643	0.9129	0.8144	0.6675	0.5225	0.5798	0.8018	0.9503	0.9877	0.9947	(86)
MIT	18.9403	19.2080	19.6307	20.1517	20.5836	20.8529	20.9522	20.9317	20.7097	20.1111	19.4184	18.8910	(87)
Th 2	19.8645	19.8662	19.8680	19.8760	19.8776	19.8846	19.8846	19.8859	19.8819	19.8776	19.8745	19.8713	(88)
util rest of house	0.9916	0.9812	0.9557	0.8912	0.7673	0.5827	0.4052	0.4618	0.7335	0.9336	0.9843	0.9935	(89)
MIT 2	17.9880	18.2551	18.6733	19.1825	19.5792	19.8046	19.8680	19.8599	19.7014	19.1555	18.4720	17.9439	(90)
Living area fraction									fLA = Living area / (4) =			0.1414	(91)
MIT	18.1227	18.3899	18.8087	19.3196	19.7212	19.9529	20.0213	20.0115	19.8440	19.2906	18.6059	18.0779	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1227	18.3899	18.8087	19.3196	19.7212	19.9529	20.0213	20.0115	19.8440	19.2906	18.6059	18.0779	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	634.8796	793.5619	939.4171	1033.5830	983.1944	753.4051	514.6395	533.5729	725.4452	742.8485	638.3239	589.6431	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2199.4396	2142.7256	1951.7440	1638.8428	1259.6900	834.6674	533.4811	562.3806	898.1287	1364.8195	1812.5217	2193.2224	(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	1164.0327	906.6380	753.1712	435.7871	205.7127	0.0000	0.0000	0.0000	0.0000	462.7464	845.4225	1193.0630	(98)
Space heating												5966.5735	(98)
Space heating per m2											(98) / (4) =	47.6183	(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	

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Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1465.7261	1153.8695	1183.4837	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8066	0.8686	0.8373	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1182.3010	1002.2190	990.9316	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	310.3532	403.6421	323.7758	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												1037.7711	(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	77.5883	100.9105	80.9440	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												259.4428	(107)
Space cooling per m2												2.0706	(108)
Energy for space heating												47.6183	(99)
Energy for space cooling												2.0706	(108)
Total												49.6889	(109)
Dwelling Fabric Energy Efficiency (DFEE)												49.7	(109)

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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 2.3900 (2b)	= 151.8128 (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)	= 316.7654 (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) =	0.1263 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3763 (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) =					0.3198 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
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	(22)				
Adj infilt rate	0.4078	0.3998	0.3918	0.3518	0.3438	0.3038	0.3038	0.2958	0.3198	0.3438	0.3598	0.3758	(22a)				
Effective ac	0.5831	0.5799	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5511	0.5591	0.5647	0.5706	(22b)				
													(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	182.0000	29.3600	152.6400	0.1800	27.4752		(29a)					
Pitched Roof	63.5200		63.5200	0.1300	8.2576		(30)					
Total net area of external elements Aum(A, m2)			309.0400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.2240		(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) =	97.0478 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 60.9578	Feb 60.6203	Mar 60.2895	Apr 58.7356	May 58.4449	Jun 57.0916	Jul 57.0916	Aug 56.8409	Sep 57.6128	Oct 58.4449	Nov 59.0330	Dec 59.6479 (38)
Heat transfer coeff	158.0056	157.6681	157.3373	155.7835	155.4927	154.1394	154.1394	153.8888	154.6607	155.4927	156.0809	156.6957 (39)
Average = Sum(39)m / 12 =												155.7821 (39)
HLP	Jan 1.2610	Feb 1.2583	Mar 1.2557	Apr 1.2433	May 1.2410	Jun 1.2302	Jul 1.2302	Aug 1.2282	Sep 1.2343	Oct 1.2410	Nov 1.2457	Dec 1.2506 (40)
HLP (average)												1.2433 (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												

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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	55.0701	55.1880	55.3040	55.8557	55.9601	56.4514	56.4514	56.5434	56.2612	55.9601	55.7492	55.5305	
alpha	4.6713	4.6792	4.6869	4.7237	4.7307	4.7634	4.7634	4.7696	4.7507	4.7307	4.7166	4.7020	
util living area	0.9990	0.9967	0.9884	0.9564	0.8680	0.7048	0.5388	0.6037	0.8546	0.9811	0.9976	0.9993	(86)
MIT	19.5330	19.7305	20.0448	20.4405	20.7620	20.9379	20.9861	20.9768	20.8385	20.3904	19.8810	19.5002	(87)
Th 2	19.8715	19.8736	19.8757	19.8855	19.8874	19.8959	19.8959	19.8975	19.8926	19.8874	19.8836	19.8798	(88)
util rest of house	0.9986	0.9955	0.9841	0.9396	0.8187	0.6083	0.4114	0.4726	0.7812	0.9710	0.9965	0.9990	(89)
MIT 2	18.5353	18.7340	19.0474	19.4394	19.7299	19.8683	19.8926	19.8912	19.8038	19.3993	18.8925	18.5090	(90)
Living area fraction									fLA = Living area / (4) =			0.1414	(91)
MIT	18.6764	18.8749	19.1884	19.5810	19.8758	20.0195	20.0472	20.0447	19.9501	19.5395	19.0323	18.6492	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6764	18.8749	19.1884	19.5810	19.8758	20.0195	20.0472	20.0447	19.9501	19.5395	19.0323	18.6492	(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	0.9338	0.8181	0.6200	0.4295	0.4911	0.7857	0.9667	0.9954	0.9986	(94)
Ext temp.	641.2860	809.1897	974.5581	1099.2280	1058.6730	793.8475	525.6606	550.3648	779.9782	778.7068	649.1423	594.4243	(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	2271.5542	2203.4002	1996.3647	1663.9190	1271.2801	835.3631	531.3556	560.8810	904.7784	1390.0235	1862.4046	2264.1282	(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	1212.9195	936.9094	760.2241	406.5775	158.1797	0.0000	0.0000	0.0000	0.0000	454.8196	873.5489	1242.2597	(98)
Space heating per m2												6045.4385	(98)
												(98) / (4) =	48.2477 (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	1448.9102	1140.6315	1169.5546	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8677	0.9253	0.8975	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1257.2853	1055.4231	1049.6768	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	256.3645	364.0583	280.0694	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												900.4922 (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	64.0911	91.0146	70.0173	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												225.1230 (107)
Space cooling per m2												1.7967 (108)
Energy for space heating												48.2477 (99)
Energy for space cooling												1.7967 (108)
Total												50.0444 (109)
Target Fabric Energy Efficiency (TFEE)												57.6 (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 2.3900 (2b)	= 151.8128 (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)	= 316.7654 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							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) =	0.1578 (8)				
Pressure test							Yes					
Measured/design AP50								4.3100				
Infiltration rate								0.3733 (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) =	0.3173 (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	0.3729	0.3491	0.3491	0.3173	0.3253	0.3094	0.3094	0.3015	0.3015	0.3253	0.3173	0.3253 (22b)
Effective ac	0.5695	0.5609	0.5609	0.5504	0.5529	0.5479	0.5479	0.5454	0.5454	0.5529	0.5504	0.5529 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Front Door			2.1200	1.1000	2.3320			(26)					
Windows (Uw = 1.20)			27.2400	1.1450	31.1908			(27)					
Ground Floor			63.5200	0.1200	7.6224	84.0000	5335.6800	(28a)					
Brick and Block	182.0000	29.3600	152.6400	0.2400	36.6336	42.2200	6444.4608	(29a)					
Pitched Roof	63.5200		63.5200	0.1000	6.3520	9.1000	578.0320	(30)					
Total net area of external elements Aum(A, m2)			309.0400					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.1308			(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) =	20504.7928	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.6456	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.5502	(36)					
Total fabric heat loss						(33) + (36) =	99.6810	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 59.5333	Feb 58.6352	Mar 58.6352	Apr 57.5299	May 57.7963	Jun 57.2700	Jul 57.2700	Aug 57.0167	Sep 57.0167	Oct 57.7963	Nov 57.5299	Dec 57.7963	(38)
Heat transfer coeff	159.2144	158.3163	158.3163	157.2109	157.4774	156.9510	156.9510	156.6977	156.6977	157.4774	157.2109	157.4774	(39)
Average = Sum(39)m / 12 =												157.4999	(39)
HLP	Jan 1.2707	Feb 1.2635	Mar 1.2635	Apr 1.2547	May 1.2568	Jun 1.2526	Jul 1.2526	Aug 1.2506	Sep 1.2506	Oct 1.2568	Nov 1.2547	Dec 1.2568	(40)
HLP (average)												1.2570	(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)
Total per year (kWh/year) = Sum(64)m =												2229.8006 (64)
2230 (64)												
RHI water heating demand												
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 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	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	35.7743	35.9772	35.9772	36.2302	36.1689	36.2901	36.2901	36.3488	36.3488	36.1689	36.2302	36.1689
alpha	3.3850	3.3985	3.3985	3.4153	3.4113	3.4193	3.4193	3.4233	3.4233	3.4113	3.4153	3.4113
util living area	0.9701	0.9541	0.9103	0.8147	0.6721	0.4604	0.3285	0.3330	0.5911	0.8430	0.9458	0.9752 (86)
MIT	19.5277	19.7205	20.0996	20.5324	20.8210	20.9643	20.9918	20.9917	20.9160	20.5660	20.0030	19.4984 (87)
Th 2	19.8639	19.8695	19.8695	19.8765	19.8748	19.8781	19.8781	19.8797	19.8797	19.8748	19.8765	19.8748 (88)
util rest of house	0.9631	0.9437	0.8901	0.7748	0.6038	0.3674	0.2193	0.2191	0.4939	0.7969	0.9309	0.9693 (89)
MIT 2	18.5655	18.7575	19.1215	19.5248	19.7650	19.8642	19.8766	19.8783	19.8410	19.5656	19.0419	18.5456 (90)
Living area fraction									fLA = Living area / (4) =			0.1414 (91)
MIT	18.7016	18.8937	19.2598	19.6673	19.9143	20.0197	20.0343	20.0358	19.9930	19.7070	19.1779	18.6803 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7016	18.8937	19.2598	19.6673	19.9143	20.0197	20.0343	20.0358	19.9930	19.7070	19.1779	18.6803 (93)

8. Space heating requirement

Utilisation	0.9537	0.9323	0.8771	0.7664	0.6064	0.3796	0.2348	0.2352	0.5044	0.7889	0.9192	0.9609 (94)
Useful gains	964.2226	1073.3990	1178.7893	1174.0509	961.6327	630.6833	364.3633	348.4145	677.5875	907.1097	930.2810	900.6276 (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	2085.9658	2041.2744	1845.9393	1504.0859	1073.1042	646.5986	366.3765	350.3408	719.7166	1197.9368	1662.9556	2044.1039 (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

Space heating	834.5770	650.4123	496.3596	237.6252	82.9348	0.0000	0.0000	0.0000	0.0000	216.3753	527.5257	850.7464 (98)
RHI space heating demand												3896.5563 (98)
												3897 (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 2.3900 (2b)	= 151.8128 (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)	= 316.7654 (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) = 0.1578 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3733 (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) =	0.3173 (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	0.4046	0.3967	0.3887	0.3491	0.3411	0.3015	0.3015	0.2935	0.3173	0.3411	0.3570	0.3729 (22b)
Effective ac	0.5819	0.5787	0.5756	0.5609	0.5582	0.5454	0.5454	0.5431	0.5504	0.5582	0.5637	0.5695 (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	182.0000	29.3600	152.6400	0.2400	36.6336	42.2200	6444.4608 (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)			309.0400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.1308		(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) =	20504.7928 (34)
	163.6456 (35)
	15.5502 (36)
(33) + (36) =	99.6810 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 60.8229 Feb 60.4906 Mar 60.1650 Apr 58.6352 May 58.3490 Jun 57.0167 Jul 57.0167 Aug 56.7699 Sep 57.5299 Oct 58.3490 Nov 58.9280 Dec 59.5333 (38)
Heat transfer coeff	160.5039 160.1717 159.8460 158.3163 158.0300 156.6977 156.6977 156.4510 157.2109 158.0300 158.6090 159.2144 (39)
Average = Sum(39)m / 12 =	158.3149 (39)

HLP	Jan 1.2810 Feb 1.2783 Mar 1.2757 Apr 1.2635 May 1.2612 Jun 1.2506 Jul 1.2506 Aug 1.2486 Sep 1.2547 Oct 1.2612 Nov 1.2658 Dec 1.2707 (40)
HLP (average)	1.2635 (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)

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Calculation Type: New Build (As Built)

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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		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	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	35.4868	35.5604	35.6329	35.9772	36.0424	36.3488	36.3488	36.4061	36.2302	36.0424	35.9108	35.7743
alpha	3.3658	3.3707	3.3755	3.3985	3.4028	3.4233	3.4233	3.4271	3.4153	3.4028	3.3941	3.3850
util living area	0.9796	0.9646	0.9330	0.8645	0.7494	0.5921	0.4502	0.4961	0.7148	0.9018	0.9666	0.9830 (86)
MIT	19.2611	19.5088	19.8898	20.3446	20.6982	20.9035	20.9713	20.9598	20.8102	20.3314	19.7095	19.2131 (87)
Th 2	19.8558	19.8579	19.8599	19.8695	19.8713	19.8797	19.8797	19.8813	19.8765	19.8713	19.8677	19.8639 (88)
util rest of house	0.9751	0.9568	0.9183	0.8346	0.6952	0.5079	0.3437	0.3872	0.6371	0.8731	0.9580	0.9792 (89)
MIT 2	18.2959	18.5407	18.9128	19.3498	19.6637	19.8300	19.8704	19.8671	19.7663	19.3505	18.7490	18.2545 (90)
Living area fraction												0.1414 (91)
MIT	18.4324	18.6776	19.0510	19.4905	19.8100	19.9818	20.0261	20.0216	19.9139	19.4893	18.8848	18.3901 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4324	18.6776	19.0510	19.4905	19.8100	19.9818	20.0261	20.0216	19.9139	19.4893	18.8848	18.3901 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9675 0.9465 0.9053 0.8230 0.6920 0.5160 0.3582 0.4016 0.6400 0.8613 0.9481 0.9724 (94)												
Useful gains	927.0065	1065.6926	1171.3123	1201.2664	1079.2102	790.4075	525.8569	550.1555	802.0387	933.1457	899.1978	879.8050 (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	2268.3100	2206.7885	2006.2223	1676.6497	1281.6180	843.3212	536.8634	566.6054	914.0112	1404.7703	1869.1763	2259.2671 (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	997.9298	766.8165	621.1730	342.2760	150.5914	0.0000	0.0000	0.0000	0.0000	350.8887	698.3845	1026.3198 (98)

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Space heating
Space heating per m2

(98) / (4) = 4954.3796 (98)
39.5401 (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													5474.4526 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	997.9298	766.8165	621.1730	342.2760	150.5914	0.0000	0.0000	0.0000	0.0000	350.8887	698.3845	1026.3198	(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)	1102.6849	847.3110	686.3790	378.2055	166.3993	0.0000	0.0000	0.0000	0.0000	387.7223	771.6956	1134.0550	(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	88.3626	88.1182	87.6032	86.4710	84.3624	79.8000	79.8000	79.8000	79.8000	86.4423	87.8783	88.4508	(216)
Fuel for water heating, kWh/month	248.5842	219.7124	232.1071	210.7990	211.7438	200.0249	192.1090	210.7942	210.4192	218.6588	227.4237	242.3634	(219)
Water heating fuel used												2624.7397	(219)
Annual totals kWh/year													
Space heating fuel - main system												5474.4526	(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												7623.7915	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5474.4526	3.4800	190.5110 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2624.7397	3.4800	91.3409 (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			339.1465 (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] =	0.8364 (257)
SAP value		88.3320
SAP rating (Section 12)		88 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5474.4526	0.2160	1182.4818 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2624.7397	0.2160	566.9438 (264)
Space and water heating			1749.4255 (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			1502.6925 (272)
CO2 emissions per m2			11.9900 (273)
EI value			88.1761
EI rating			88 (274)

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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	$3.48 / 0.8474 = 4.107$, stars = 4
Water heating environmental impact	$0.216 / 0.8474 = 0.2549$, stars = 4

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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 2.3900 (2b)	= 151.8128 (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)	= 316.7654 (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) =	0.1578 (8)	
Pressure test										Yes							
Measured/design AP50										4.3100							
Infiltration rate										0.3733 (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) =					0.3173 (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	0.3729	0.3491	0.3491	0.3173	0.3253	0.3094	0.3094	0.3015	0.3015	0.3253	0.3173	0.3253	(22b)				
Effective ac	0.5695	0.5609	0.5609	0.5504	0.5529	0.5479	0.5479	0.5454	0.5454	0.5529	0.5504	0.5529	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Front Door			2.1200	1.1000	2.3320			(26)					
Windows (Uw = 1.20)			27.2400	1.1450	31.1908			(27)					
Ground Floor			63.5200	0.1200	7.6224	84.0000	5335.6800	(28a)					
Brick and Block	182.0000	29.3600	152.6400	0.2400	36.6336	42.2200	6444.4608	(29a)					
Pitched Roof	63.5200		63.5200	0.1000	6.3520	9.1000	578.0320	(30)					
Total net area of external elements Aum(A, m2)			309.0400					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.1308			(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) =		20504.7928	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.6456	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.5502	(36)					
Total fabric heat loss						(33) + (36) =	99.6810	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 59.5333	Feb 58.6352	Mar 58.6352	Apr 57.5299	May 57.7963	Jun 57.2700	Jul 57.2700	Aug 57.0167	Sep 57.0167	Oct 57.7963	Nov 57.5299	Dec 57.7963	(38)
Heat transfer coeff	159.2144	158.3163	158.3163	157.2109	157.4774	156.9510	156.9510	156.6977	156.6977	157.4774	157.2109	157.4774	(39)
Average = Sum(39)m / 12 =												157.4999	(39)
HLP	Jan 1.2707	Feb 1.2635	Mar 1.2635	Apr 1.2547	May 1.2568	Jun 1.2526	Jul 1.2526	Aug 1.2506	Sep 1.2506	Oct 1.2568	Nov 1.2547	Dec 1.2568	(40)
HLP (average)												1.2570	(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 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	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)												
tau	35.7743	35.9772	35.9772	36.2302	36.1689	36.2901	36.2901	36.3488	36.3488	36.1689	36.2302	36.1689
alpha	3.3850	3.3985	3.3985	3.4153	3.4113	3.4193	3.4193	3.4233	3.4233	3.4113	3.4153	3.4113
util living area	0.9701	0.9541	0.9103	0.8147	0.6721	0.4604	0.3285	0.3330	0.5911	0.8430	0.9458	0.9752 (86)
MIT	19.5277	19.7205	20.0996	20.5324	20.8210	20.9643	20.9918	20.9917	20.9160	20.5660	20.0030	19.4984 (87)
Th 2	19.8639	19.8695	19.8695	19.8765	19.8748	19.8781	19.8781	19.8797	19.8797	19.8748	19.8765	19.8748 (88)
util rest of house	0.9631	0.9437	0.8901	0.7748	0.6038	0.3674	0.2193	0.2191	0.4939	0.7969	0.9309	0.9693 (89)
MIT 2	18.5655	18.7575	19.1215	19.5248	19.7650	19.8642	19.8766	19.8783	19.8410	19.5656	19.0419	18.5456 (90)
Living area fraction	18.7016	18.8937	19.2598	19.6673	19.9143	20.0197	20.0343	20.0358	19.9930	19.7070	19.1779	18.6803 (91)
MIT	18.7016	18.8937	19.2598	19.6673	19.9143	20.0197	20.0343	20.0358	19.9930	19.7070	19.1779	18.6803 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7016	18.8937	19.2598	19.6673	19.9143	20.0197	20.0343	20.0358	19.9930	19.7070	19.1779	18.6803 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	964.2226	1073.3990	1178.7893	1174.0509	961.6327	630.6833	364.3633	348.4145	677.5875	907.1097	930.2810	900.6276 (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	2085.9658	2041.2744	1845.9393	1504.0859	1073.1042	646.5986	366.3765	350.3408	719.7166	1197.9368	1662.9556	2044.1039 (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	834.5770	650.4123	496.3596	237.6252	82.9348	0.0000	0.0000	0.0000	0.0000	216.3753	527.5257	850.7464 (98)

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Space heating 3896.5563 (98)
Space heating per m2 (98) / (4) = 31.0978 (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 4305.5871 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	834.5770	650.4123	496.3596	237.6252	82.9348	0.0000	0.0000	0.0000	0.0000	216.3753	527.5257	850.7464 (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)	922.1845	718.6876	548.4637	262.5693	91.6407	0.0000	0.0000	0.0000	0.0000	239.0888	582.9013	940.0513 (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	88.0404	87.7995	87.1059	85.5221	82.9080	79.8000	79.8000	79.8000	79.8000	85.1751	87.2843	79.8000 (216)
Fuel for water heating, kWh/month	249.4940	220.5099	233.4324	213.1379	215.4582	200.0249	192.1090	210.7942	210.4192	221.9119	228.9713	243.2680 (219)
Water heating fuel used												2639.5308 (219)
Annual totals kWh/year												
Space heating fuel - main system												4305.5871 (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												6351.3265 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4305.5871	3.6300	156.2928 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2639.5308	3.6300	95.8150 (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			231.6747 (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	4305.5871	0.2160	930.0068 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2639.5308	0.2160	570.1387 (264)
Space and water heating			1500.1455 (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			1191.9677 (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	4305.5871	1.2200	5252.8163 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2639.5308	1.2200	3220.2276 (264)
Space and water heating			8473.0438 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	460.0342	3.0700	1412.3049 (268)

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Energy saving/generation technologies
PV Unit -1128.8256 3.0700 -3465.4945 (269)
Primary energy kWh/year 6650.1042 (272)
Primary energy kWh/m2/year 53.0735 (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 (22.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£40 2.16 kg/m²	B 90	B 90
Total Savings	£40 2.16 kg/m²		

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	£347	£297	£50
Space heating	£266	£267	-£1
Water heating	£96	£54	£42
Lighting	£89	£89	£0
Generated (PV)	-£219	-£219	£0
Total cost of fuels	£232	£192	£40
Total cost of uses	£232	£191	£41
Delivered energy	51 kWh/m²	40 kWh/m²	11 kWh/m²
Carbon dioxide emissions	1.2 tonnes	0.9 tonnes	0.3 tonnes
CO2 emissions per m²	10 kg/m²	7 kg/m²	2 kg/m²
Primary energy	53 kWh/m²	41 kWh/m²	12 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.5200 (1b)	x 2.3900 (2b)	= 151.8128 (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)	= 316.7654 (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) = 0.1578 (8)
Pressure test					Yes
Measured/design AP50					4.3100
Infiltration rate					0.3733 (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) =	0.3173 (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	0.4046	0.3967	0.3887	0.3491	0.3411	0.3015	0.3015	0.2935	0.3173	0.3411	0.3570	0.3729 (22b)
Effective ac	0.5819	0.5787	0.5756	0.5609	0.5582	0.5454	0.5454	0.5431	0.5504	0.5582	0.5637	0.5695 (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	182.0000	29.3600	152.6400	0.2400	36.6336	42.2200	6444.4608 (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)			309.0400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.1308		(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) =	20504.7928 (34)
	163.6456 (35)
	15.5502 (36)
(33) + (36) =	99.6810 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 60.8229 Feb 60.4906 Mar 60.1650 Apr 58.6352 May 58.3490 Jun 57.0167 Jul 57.0167 Aug 56.7699 Sep 57.5299 Oct 58.3490 Nov 58.9280 Dec 59.5333 (38)
Heat transfer coeff	160.5039 160.1717 159.8460 158.3163 158.0300 156.6977 156.6977 156.4510 157.2109 158.0300 158.6090 159.2144 (39)
Average = Sum(39)m / 12 =	158.3149 (39)

HLP	Jan 1.2810 Feb 1.2783 Mar 1.2757 Apr 1.2635 May 1.2612 Jun 1.2506 Jul 1.2506 Aug 1.2486 Sep 1.2547 Oct 1.2612 Nov 1.2658 Dec 1.2707 (40)
HLP (average)	1.2635 (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)

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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	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											
Specific data	g											
Specific data	or Table 6b											
FF	Specific data											
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	35.4868	35.5604	35.6329	35.9772	36.0424	36.3488	36.3488	36.4061	36.2302	36.0424	35.9108	35.7743
alpha	3.3658	3.3707	3.3755	3.3985	3.4028	3.4233	3.4233	3.4271	3.4153	3.4028	3.3941	3.3850
util living area												
0.9803 0.9655 0.9346 0.8681 0.7558 0.5994 0.4570 0.5036 0.7205 0.9043 0.9677 0.9836 (86)												
MIT	19.2511	19.4994	19.8803	20.3339	20.6895	20.8997	20.9700	20.9580	20.8052	20.3230	19.7000	19.2029 (87)
Th 2	19.8558	19.8579	19.8599	19.8695	19.8713	19.8797	19.8797	19.8813	19.8765	19.8713	19.8677	19.8639 (88)
util rest of house												
0.9759 0.9579 0.9201 0.8387 0.7021 0.5148 0.3493 0.3935 0.6431 0.8762 0.9593 0.9799 (89)												
MIT 2	18.2861	18.5316	18.9038	19.3403	19.6570	19.8279	19.8699	19.8664	19.7630	19.3430	18.7397	18.2445 (90)
Living area fraction												
fLA = Living area / (4) =												0.1414 (91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

MIT	18.4226	18.6684	19.0419	19.4809	19.8030	19.9795	20.0255	20.0207	19.9104	19.4816	18.8755	18.3801 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4226	18.6684	19.0419	19.4809	19.8030	19.9795	20.0255	20.0207	19.9104	19.4816	18.8755	18.3801 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9684	0.9477	0.9073	0.8269	0.6985	0.5229	0.3639	0.4080	0.6457	0.8643	0.9495	0.9733 (94)	
Useful gains	917.3881	1056.7834	1162.5898	1191.8396	1072.1463	787.8875	525.2129	549.2011	798.3645	925.7712	890.2394	870.0146 (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	2266.7283	2205.3149	2004.7764	1675.1211	1280.5245	842.9532	536.7692	566.4664	913.4545	1403.5654	1867.7056	2257.6700 (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	1003.9091	771.8132	626.5868	347.9626	155.0334	0.0000	0.0000	0.0000	0.0000	355.4789	703.7757	1032.4156 (98)	
Space heating												4996.9752 (98)	
Space heating per m2												(98) / (4) = 39.8801 (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	5521.5196 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1003.9091	771.8132	626.5868	347.9626	155.0334	0.0000	0.0000	0.0000	0.0000	355.4789	703.7757	1032.4156 (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)	1109.2918	852.8322	692.3611	384.4891	171.3076	0.0000	0.0000	0.0000	0.0000	392.7943	777.6527	1140.7907 (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	88.6728	88.6854	88.6651	88.7034	88.7104	79.8000	79.8000	79.8000	79.8000	87.5492	88.3314	88.7217 (217)	
Fuel for water heating, kWh/month	205.5777	156.7230	128.9773	69.8001	30.9504	13.9320	7.1697	46.7174	84.6794	136.3355	178.5815	204.5236 (219)	
Annual totals kWh/year												1263.9678 (219)	
Space heating fuel - main system												5521.5196 (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		6360.0866 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5521.5196	3.4800	192.1489 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	1263.9678	3.4800	43.9861 (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			300.0246 (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] = 0.7399 (257)
SAP value	89.6780
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	5521.5196	0.2160	1192.6482 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1263.9678	0.2160	273.0170 (264)
Space and water heating			1465.6653 (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			
Total kg/year	-1010.4350	0.5190	-524.4158 (269)
CO2 emissions per m2			1244.8822 (272)
EI value			9.9400 (273)
EI rating			90.2047
EI band			90 (274) 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 2.3900 (2b)	= 151.8128 (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)	= 316.7654 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							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) =	0.1578 (8)				
Pressure test							Yes					
Measured/design AP50								4.3100				
Infiltration rate								0.3733 (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) =	0.3173 (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	0.3729	0.3491	0.3491	0.3173	0.3253	0.3094	0.3094	0.3015	0.3015	0.3253	0.3173	0.3253 (22b)
Effective ac	0.5695	0.5609	0.5609	0.5504	0.5529	0.5479	0.5479	0.5454	0.5454	0.5529	0.5504	0.5529 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Front Door			2.1200	1.1000	2.3320			(26)					
Windows (Uw = 1.20)			27.2400	1.1450	31.1908			(27)					
Ground Floor			63.5200	0.1200	7.6224	84.0000	5335.6800	(28a)					
Brick and Block	182.0000	29.3600	152.6400	0.2400	36.6336	42.2200	6444.4608	(29a)					
Pitched Roof	63.5200		63.5200	0.1000	6.3520	9.1000	578.0320	(30)					
Total net area of external elements Aum(A, m2)			309.0400					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	84.1308			(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) =	20504.7928	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.6456	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.5502	(36)					
Total fabric heat loss						(33) + (36) =	99.6810	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 59.5333	Feb 58.6352	Mar 58.6352	Apr 57.5299	May 57.7963	Jun 57.2700	Jul 57.2700	Aug 57.0167	Sep 57.0167	Oct 57.7963	Nov 57.5299	Dec 57.7963	(38)
Heat transfer coeff	159.2144	158.3163	158.3163	157.2109	157.4774	156.9510	156.9510	156.6977	156.6977	157.4774	157.2109	157.4774	(39)
Average = Sum(39)m / 12 =												157.4999	(39)
HLP	Jan 1.2707	Feb 1.2635	Mar 1.2635	Apr 1.2547	May 1.2568	Jun 1.2526	Jul 1.2526	Aug 1.2506	Sep 1.2506	Oct 1.2568	Nov 1.2547	Dec 1.2568	(40)
HLP (average)												1.2570	(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 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 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 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 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 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 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 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 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 -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 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 717.0310 (73)												

6. Solar gains

[Jan]												
Area												
m2												
Solar flux												
Table 6a												
W/m2												
Specific data												
or Table 6b												
g												
Specific data												
or Table 6c												
FF												
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, 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	35.7743	35.9772	35.9772	36.2302	36.1689	36.2901	36.2901	36.3488	36.3488	36.1689	36.2302	36.1689
alpha	3.3850	3.3985	3.3985	3.4153	3.4113	3.4193	3.4193	3.4233	3.4233	3.4113	3.4153	3.4113
util living area												
0.9710 0.9552 0.9122 0.8189 0.6790 0.4665 0.3336 0.3382 0.5967 0.8464 0.9473 0.9760 0.9760 (86)												
MIT	19.5181	19.7114	20.0909	20.5237	20.8151	20.9628	20.9914	20.9913	20.5594	19.9942	19.4885 (87)	
Th 2	19.8639	19.8695	19.8695	19.8765	19.8748	19.8781	19.8781	19.8797	19.8797	19.8748	19.8765	19.8748 (88)
util rest of house												
0.9642 0.9450 0.8924 0.7794 0.6108 0.3726 0.2228 0.2226 0.4992 0.8009 0.9328 0.9703 0.9703 (89)												
MIT 2	18.5561	18.7487	19.1135	19.5176	19.7610	19.8636	19.8765	19.8782	19.8397	19.5602	19.0336	18.5359 (90)
Living area fraction												
fLA = Living area / (4) =												0.1414 (91)

MIT	18.6922	18.8849	19.2517	19.6599	19.9101	20.0190	20.0342	20.0357	19.9916	19.7015	19.1695	18.6706 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6922	18.8849	19.2517	19.6599	19.9101	20.0190	20.0342	20.0357	19.9916	19.7015	19.1695	18.6706 (93)

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4346.1709	0.2160	938.7729 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1223.0782	0.2160	264.1849 (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			1202.9578 (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			920.7301 (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	4346.1709	1.2200	5302.3285 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1223.0782	1.2200	1492.1554 (264)
Space and water heating			6794.4839 (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			5125.0443 (272)
Primary energy kWh/m2/year			40.9022 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 78	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Project	19 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.44	TER	16.70
Environmental	88 B	% DER<TER	19.54		
CO ₂ Emissions (t/year)	1.19	DFEE	49.69	TTEE	57.55
General Requirements Compliance	Pass	% DFEE<TTEE	13.66		

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 78	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Project	19 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.44	TER	16.70
Environmental	88 B	% DER<TER	19.54		
CO ₂ Emissions (t/year)	1.19	DFEE	49.69	TFEE	57.55
General Requirements Compliance	Pass	% DFEE<TFEE	13.66		

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

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	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 78	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Project	19 Haines Crescent, West End, Southampton, SO30 3LG		
Calculation Type	New Build (As Built)		

SAP Rating	88 B	DER	13.44	TER	16.70
Environmental	88 B	% DER<TER	19.54		
CO ₂ Emissions (t/year)	1.19	DFEE	49.69	TFEE	57.55
General Requirements Compliance	Pass	% DFEE<TFEE	13.66		

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 = 35.11 m², Perimeter = 16.79 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 78	Issued on Date	12/05/2022
Assessment Reference	As Built	Prop Type Ref	Nv
Property	19 Haines Crescent, West End, Southampton, SO30 3LG		
SAP Rating	88 B	DER	13.44
Environmental	88 B	TER	16.70
CO ₂ Emissions (t/year)	1.19	% DER<TER	19.54
General Requirements Compliance	Pass	DfEE	49.69
		TfEE	57.55
		% DfEE<TfEE	13.66
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
	1st Storey:	34.91 m	61.78 m ²
			2.39 m
			2.67 m

7.0 Living Area	17.72	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	163.65	kJ/m ² K

9.0 External Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
Brick and Block	Cavity Wall	Other		0.24	42.22	182.00	152.64

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

9.2 Internal Walls				Kappa (kJ/m ² K)	Area (m ²)
Description	Construction				
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				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
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	Manufacture	Solid Door							1.10
Windows	Manufacture	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	0.044	No	Knauf P21
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	4.31	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

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