



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 5 Oram Way
WEST END, SO30 3JW

Contact: Tobias Whiting
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Report Issue Date: 16/02/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Property Reference	SAP 0647 Plot 5				Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	B (H/A - SO)			
Property	5 Oram Way, WEST END, SO30 3JW					
SAP Rating	87 B	DER	14.62	TER	18.40	
Environmental	89 B	% DER<TER	20.52			
CO ₂ Emissions (t/year)	0.92	DFEE	44.30	TFEE	52.35	
General Requirements Compliance	Pass	% DFEE<TFEE	15.39			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.40	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.62	kgCO ₂ /m ²	Pass
	-3.78 (-20.5%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.35	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.30	kWh/m ² /yr	
	-8.1 (-15.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (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	4.19 (measured in this dwelling)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Built)

Main heating system

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

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system

Specific fan power

0.30

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

7.38 m², No overhang

Windows facing South

4.65 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

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

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

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

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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	0.62	kW

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THERMAL BRIDGING

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Environmental	89 B	% DER<TER	20.52		
CO ₂ Emissions (t/year)	0.92	DFEE	44.30	TFEE	52.35
General Requirements Compliance	Pass	% DFEE<TFEE	15.39		

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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.098	1.12	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	1.01	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	4.80	0.21	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.060	3.27	0.20	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.034	7.69	0.26	CD0027
External wall	E4 Jamb	Independently assessed	0.039	24.60	0.96	CD0028
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	18.46	2.95	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.46	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.69	0.58	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	8.78	0.47	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	10.10	0.51	CD0035
External wall	E25 Staggered party wall between dwellings	Table K1 - Default	0.120	10.10	1.21	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.77	1.40	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.77	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.049	8.77	0.43	CD0020

Total: **9.35** W/mK:
Y-Value: **0.053** W/m²K:

FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Semi-Detached House, total floor area 84 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.40 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.62 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)52.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)44.3 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:	4.19 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Worcester Greenstar 30Si Compact ErP

Combi boiler

Efficiency: 89.8% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system

Specific fan power:	0.30	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:	Average
Windows facing North:	7.38 m ² , No overhang
Windows facing South:	4.65 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	0.62 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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1900
Infiltration rate					0.2095 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1938 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2471	0.2422	0.2374	0.2132	0.2083	0.1841	0.1841	0.1793	0.1938	0.2083	0.2180	0.2277 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.0300	1.1450	13.7748		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.4600	14.1500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4032		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			73.3100			9.0000	659.7900 (32c)
First Floor			83.3600			9.0000	750.2400 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13296.7082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.9181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3458 (36)
Total fabric heat loss						(33) + (36) =	53.7490 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493 (38)
Average = Sum(39)m / 12 =	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy content (annual)	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2047	30.1650	31.1464	30.1139	31.1004	31.1302	30.1417	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (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	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (64)
Heat gains from water heating, kWh/month	59.0516	51.8684	54.0469	47.8594	46.4728	40.9117	38.7096	43.2804	43.4572	49.6585	53.2503	57.4325 (65)
Total per year (kWh/year) = Sum(64)m =												1853.4849 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.7101	19.2827	15.6818	11.8721	8.8745	7.4923	8.0957	10.5230	14.1240	17.9337	20.9312	22.3135 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.9943	230.3601	224.3982	211.7060	195.6844	180.6263	170.5666	168.2008	174.1627	186.8549	202.8765	217.9346 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887 (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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096 (71)
Water heating gains (Table 5)	79.3705	77.1851	72.6437	66.4714	62.4635	56.8219	52.0290	58.1725	60.3572	66.7453	73.9588	77.1942 (72)
Total internal gains	393.1410	390.8941	376.7898	354.1156	331.0885	309.0066	294.7574	300.9624	312.7100	335.5999	361.8326	381.5084 (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				7.3800	10.6334	0.6300	0.7000	0.7700	23.9828 (74)			
South				4.6500	46.7521	0.6300	0.7000	0.7700	66.4394 (78)			
Solar gains	90.4222	154.6430	216.4858	281.7501	331.7590	337.5005	321.9231	238.4272	171.9199	108.3392	77.4030 (83)	
Total gains	483.5631	545.5370	593.2756	635.8657	662.8475	646.5070	616.6805	583.6537	551.1371	507.5198	470.1718	458.9114 (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	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478
Feb	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699
util living area	0.9901	0.9835	0.9703	0.9387	0.8677	0.7372	0.5872	0.6335	0.8304	0.9501	0.9836	0.9919 (86)
MIT	19.3780	19.5572	19.8496	20.2279	20.5943	20.8510	20.9532	20.9368	20.7489	20.2867	19.7531	19.3256 (87)
Th 2	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371 (88)
util rest of house	0.9880	0.9800	0.9635	0.9233	0.8320	0.6636	0.4771	0.5256	0.7729	0.9347	0.9794	0.9901 (89)
MIT 2	18.5515	18.7292	19.0182	19.3873	19.7313	19.9495	20.0188	20.0104	19.8729	19.4492	18.9251	18.4994 (90)
Living area fraction	18.7299	18.9079	19.1977	19.5688	19.9176	20.1442	20.2206	20.2104	20.0620	19.6300	19.1038	18.6778 (92)
Temperature adjustment	18.7299	18.9079	19.1977	19.5688	19.9176	20.1442	20.2206	20.2104	20.0620	19.6300	19.1038	18.6778 (93)

8. Space heating requirement

Utilisation	0.9841	0.9745	0.9560	0.9143	0.8269	0.6726	0.4994	0.5465	0.7746	0.9264	0.9740	0.9867 (94)
Useful gains	475.8750	531.6127	567.1574	581.3505	548.1372	434.8531	307.9773	318.9870	426.9310	470.1895	457.9574	452.8156 (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	1282.7972	1245.2824	1128.8082	948.4356	730.5319	492.8664	321.8637	338.7402	530.0154	802.7510	1067.1207	1287.0527 (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	600.3501	479.5861	417.8682	264.3013	135.7017	0.0000	0.0000	0.0000	0.0000	247.4257	438.5976	620.6724 (98)
Space heating												3204.5031 (98)
Space heating per m2												(98) / (4) = 38.0582 (99)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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 %)	90.7000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	3533.0795 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	600.3501	479.5861	417.8682	264.3013	135.7017	0.0000	0.0000	0.0000	0.0000	247.4257	438.5976	620.6724 (98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000 (210)
Space heating fuel (main heating system)	661.9075	528.7608	460.7147	291.4016	149.6160	0.0000	0.0000	0.0000	0.0000	272.7957	483.5696	684.3136 (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	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (64)
Efficiency of water heater (217)m	89.7991	89.7320	89.5968	89.3164	88.7345	87.0000	87.0000	87.0000	87.0000	89.2264	89.6457	87.0000 (216)
Fuel for water heating, kWh/month	206.4063	181.6463	190.0623	169.5350	166.2216	150.0169	142.6856	158.4948	158.8242	176.0526	187.0114	200.8910 (219)
Water heating fuel used												2087.8481 (219)
Annual totals kWh/year												
Space heating fuel - main system												3533.0795 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4200)												
mechanical ventilation fans (SFP = 0.4200)												109.1545 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												184.1545 (231)
Electricity for lighting (calculated in Appendix L)												383.4073 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.62 * 1080 * 1.00) =												-535.4442 (233)
Total delivered energy for all uses												5653.0452 (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	3533.0795	0.2160	763.1452 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2087.8481	0.2160	450.9752 (264)
Space and water heating			1214.1204 (265)
Pumps and fans	184.1545	0.5190	95.5762 (267)
Energy for lighting	383.4073	0.5190	198.9884 (268)
Energy saving/generation technologies			
PV Unit	-535.4442	0.5190	-277.8955 (269)
Total CO2, kg/year			1230.7894 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6200 (273)

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

DER		14.6200 ZC1
Total Floor Area	TFA	84.2000
Assumed number of occupants	N	2.5377
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.0457 ZC2
CO2 emissions from cooking, equation (L16)		2.1366 ZC3
Total CO2 emissions		32.8023 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		32.8023 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (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																3 * 10 =	30.0000 (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) =					30.0000	/ (5) =	0.1408 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3908 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3615 (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	0.4609	0.4519	0.4429	0.3977	0.3886	0.3434	0.3434	0.3344	0.3615	0.3886	0.4067	0.4248	(22b)				
Effective ac	0.6062	0.6021	0.5981	0.5791	0.5755	0.5590	0.5590	0.5559	0.5653	0.5755	0.5827	0.5902	(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)			12.0300	1.3258	15.9489		(27)					
Ground Floor			42.1000	0.1300	5.4730		(28a)					
Brick and Block	93.4600	14.1500	79.3100	0.1800	14.2758		(29a)					
Pitched Roof	42.1000		42.1000	0.1300	5.4730		(30)					
Total net area of external elements Aum(A, m2)			177.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	43.2907		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4553 (36)					
Total fabric heat loss						(33) + (36) =	52.7460 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.6171	Feb 42.3271	Mar 42.0428	Apr 40.7078	May 40.4580	Jun 39.2952	Jul 39.2952	Aug 39.0799	Sep 39.7431	Oct 40.4580	Nov 40.9633	Dec 41.4916 (38)
Heat transfer coeff	95.3630	95.0730	94.7888	93.4537	93.2040	92.0411	92.0411	91.8258	92.4890	93.2040	93.7093	94.2376 (39)
Average = Sum(39)m / 12 =												93.4525 (39)
HLP	Jan 1.1326	Feb 1.1291	Mar 1.1258	Apr 1.1099	May 1.1069	Jun 1.0931	Jul 1.0931	Aug 1.0906	Sep 1.0984	Oct 1.1069	Nov 1.1129	Dec 1.1192 (40)
HLP (average)												1.1099 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Daily hot water use	Jan 103.9184	Feb 100.1396	Mar 96.3607	Apr 92.5819	May 88.8030	Jun 85.0242	Jul 85.0242	Aug 88.8030	Sep 92.5819	Oct 96.3607	Nov 100.1396	Dec 103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (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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Combi 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)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.1044	45.6568	45.2531	41.9297	43.3274	45.2531	45.6568	49.1044	49.3151	50.9589 (61)
Solar input	205.0670	180.8113	188.1893	166.9144	161.6026	142.3305	136.3635	152.0133	153.6922	175.0092	186.7500	200.2043 (62)
Output from w/h	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)
Heat gains from water heating, kWh/month	205.0670	180.8113	188.1893	166.9144	161.6026	142.3305	136.3635	152.0133	153.6922	175.0092	186.7500	200.2043 (64)
	63.9807	56.3225	58.5218	51.7324	49.9995	43.8657	41.7664	46.8111	47.3360	54.1394	58.0259	62.3638 (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	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.7101	19.2827	15.6818	11.8721	8.8745	7.4923	8.0957	10.5230	14.1240	17.9337	20.9312	22.3135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.9943	230.3601	224.3982	211.7060	195.6844	180.6263	170.5666	168.2008	174.1627	186.8549	202.8765	217.9346	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	85.9955	83.8132	78.6584	71.8505	67.2036	60.9246	56.1376	62.9181	65.7444	72.7681	80.5915	83.8223	(72)
Total internal gains	399.7660	397.5222	382.8044	359.4947	335.8286	313.1093	298.8659	305.7080	318.0971	341.6227	368.4653	388.1365	(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					7.3800	10.6334	0.6300	0.7000			0.7700	23.9828
South					4.6500	46.7521	0.6300	0.7000			0.7700	66.4394 (74)
Solar gains	90.4222	154.6430	216.4858	281.7501	331.7590	337.5005	321.9231	282.6913	238.4272	171.9199	108.3392	77.4030 (83)
Total gains	490.1881	552.1651	599.2902	641.2448	667.5876	650.6097	620.7891	588.3993	556.5243	513.5425	476.8045	465.5395 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.3154	61.5024	61.6868	62.5681	62.7358	63.5283	63.5283	63.6773	63.2207	62.7358	62.3975	62.0477	
alpha	5.0877	5.1002	5.1125	5.1712	5.1824	5.2352	5.2352	5.2452	5.2147	5.1824	5.1598	5.1365	
util living area	0.9983	0.9965	0.9919	0.9762	0.9259	0.7952	0.6263	0.6771	0.8906	0.9822	0.9964	0.9987	(86)
MIT	19.7656	19.9022	20.1261	20.4328	20.7204	20.9192	20.9818	20.9730	20.8395	20.4773	20.0708	19.7457	(87)
Th 2	19.9743	19.9771	19.9799	19.9928	19.9952	20.0065	20.0065	20.0085	20.0021	19.9952	19.9903	19.9852	(88)
util rest of house	0.9977	0.9952	0.9888	0.9665	0.8930	0.7104	0.4980	0.5507	0.8309	0.9730	0.9950	0.9982	(89)
MIT 2	18.3261	18.5276	18.8556	19.3066	19.7038	19.9480	19.9992	19.9964	19.8644	19.3761	18.7838	18.3048	(90)
Living area fraction	18.6369	18.8244	19.1299	19.5498	19.9233	20.1577	20.2113	20.2073	20.0750	19.6138	19.0617	18.6159	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6369	18.8244	19.1299	19.5498	19.9233	20.1577	20.2113	20.2073	20.0750	19.6138	19.0617	18.6159	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9965	0.9932	0.9853	0.9608	0.8902	0.7248	0.5258	0.5778	0.8361	0.9682	0.9930	0.9973	(94)
Ext temp.	488.4823	548.4249	590.4580	616.0871	594.2733	471.5670	326.4028	339.9871	465.3230	497.1887	473.4589	464.2884	(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	1367.2122	1323.8382	1197.1746	995.2630	766.4434	511.5359	332.3915	349.6076	552.6201	840.1250	1120.9211	1358.5187	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	653.7750	521.0777	451.3972	273.0067	128.0946	0.0000	0.0000	0.0000	0.0000	255.1447	466.1728	665.3074	(98)
												3413.9760	(98)
												40.5460	(99)

8c. Space cooling requirement

Not applicable

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

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Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3655.2205 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	653.7750	521.0777	451.3972	273.0067	128.0946	0.0000	0.0000	0.0000	0.0000	255.1447	466.1728	665.3074	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	699.9733	557.8991	483.2946	292.2984	137.1462	0.0000	0.0000	0.0000	0.0000	273.1742	499.1143	712.3205	(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	205.0670	180.8113	188.1893	166.9144	161.6026	142.3305	136.3635	152.0133	153.6922	175.0092	186.7500	200.2043	(64)
Efficiency of water heater (217)m	87.7642	87.5628	87.1738	86.2824	84.4731	80.3000	80.3000	80.3000	80.3000	85.9991	87.2608	87.8442	(217)
Fuel for water heating, kWh/month	233.6566	206.4931	215.8782	193.4513	191.3066	177.2485	169.8175	189.3068	191.3975	203.5010	214.0137	227.9083	(219)
Water heating fuel used												2413.9791	(219)
Annual totals kWh/year													
Space heating fuel - main system												3655.2205	(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)												383.4073	(232)
Total delivered energy for all uses												6527.6070	(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	3655.2205	0.2160	789.5276 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2413.9791	0.2160	521.4195 (264)
Space and water heating			1310.9471 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	383.4073	0.5190	198.9884 (268)
Total CO2, kg/m2/year			1548.8605 (272)
Emissions per m2 for space and water heating			15.5694 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3633 (272b)
Emissions per m2 for pumps and fans			0.4623 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5694 * 1.00) + 2.3633 + 0.4623, rounded to 2 d.p.			18.4000 (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1408 (8)
Pressure test					Yes
Measured/design AP50					4.1900
Infiltration rate					0.3503 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3241 (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	0.4132	0.4051	0.3970	0.3565	0.3484	0.3079	0.3079	0.2997	0.3241	0.3484	0.3646	0.3808 (22b)
Effective ac	0.5854	0.5820	0.5788	0.5635	0.5607	0.5474	0.5474	0.5449	0.5525	0.5607	0.5665	0.5725 (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)			12.0300	1.1450	13.7748		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.4600	14.1500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4032		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			73.3100			9.0000	659.7900 (32c)
First Floor			83.3600			9.0000	750.2400 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			9.0000	378.9000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12917.8082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 153.4181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.3458 (36)
Total fabric heat loss (33) + (36) = 53.7490 (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	41.1495	40.9165	40.6882	39.6155	39.4148	38.4805	38.4805	38.3074	38.8403	39.4148	39.8208	40.2452 (38)
Heat transfer coeff	94.8986	94.6656	94.4372	93.3645	93.1638	92.2295	92.2295	92.0565	92.5893	93.1638	93.5698	93.9942 (39)
Average = Sum(39)m / 12 =												93.3635 (39)
HLP	1.1271	1.1243	1.1216	1.1088	1.1065	1.0954	1.0954	1.0933	1.0996	1.1065	1.1113	1.1163 (40)
HLP (average)												1.1088 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)

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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	32.7480	28.6416	29.5555	25.7672	24.7243	21.3352	19.7702	22.6866	22.9575	26.7548	29.2049	31.7147 (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	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.7101	19.2827	15.6818	11.8721	8.8745	7.4923	8.0957	10.5230	14.1240	17.9337	20.9312	22.3135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.9943	230.3601	224.3982	211.7060	195.6844	180.6263	170.5666	168.2008	174.1627	186.8549	202.8765	217.9346	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	44.0161	42.6214	39.7252	35.7878	33.2316	29.6322	26.5728	30.4927	31.8854	35.9607	40.5624	42.6272	(72)
Total internal gains	354.7865	353.3303	340.8713	320.4320	298.8566	278.8169	266.3012	270.2826	281.2382	301.8153	325.4362	343.9414	(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					7.3800	10.6334	0.6300	0.7000			0.7700	23.9828
South					4.6500	46.7521	0.6300	0.7000			0.7700	66.4394 (78)
Solar gains	90.4222	154.6430	216.4858	281.7501	331.7590	337.5005	321.9231	282.6913	238.4272	171.9199	108.3392	77.4030 (83)
Total gains	445.2087	507.9733	557.3570	602.1821	630.6155	616.3173	588.2243	552.9739	519.6654	473.7352	433.7754	421.3444 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.8117	37.9048	37.9965	38.4330	38.5158	38.9060	38.9060	38.9791	38.7548	38.5158	38.3487	38.1755	
alpha	3.5208	3.5270	3.5331	3.5622	3.5677	3.5937	3.5937	3.5986	3.5837	3.5677	3.5566	3.5450	
util living area	0.9917	0.9861	0.9748	0.9474	0.8856	0.7651	0.6210	0.6687	0.8545	0.9586	0.9865	0.9932	(86)
MIT	19.1530	19.3457	19.6636	20.0922	20.4997	20.8066	20.9340	20.9125	20.6830	20.1638	19.5842	19.1196	(87)
Th 2	19.9788	19.9810	19.9832	19.9936	19.9956	20.0046	20.0046	20.0063	20.0011	19.9956	19.9916	19.9875	(88)
util rest of house	0.9899	0.9830	0.9689	0.9338	0.8528	0.6930	0.5062	0.5581	0.8010	0.9454	0.9830	0.9917	(89)
MIT 2	18.2871	18.4802	18.7969	19.2251	19.6137	19.8883	19.9782	19.9682	19.7894	19.3012	18.7265	18.2603	(90)
Living area fraction									fLA = Living area / (4) =			0.2159	(91)
MIT	18.4740	18.6671	18.9840	19.4123	19.8050	20.0866	20.1845	20.1721	19.9823	19.4874	18.9117	18.4459	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4740	18.6671	18.9840	19.4123	19.8050	20.0866	20.1845	20.1721	19.9823	19.4874	18.9117	18.4459	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.0951	496.6425	535.8092	556.4126	533.1380	431.1923	310.9492	319.7992	415.6285	443.7445	424.1731	416.5286	(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	1345.0949	1303.2702	1178.9546	981.4734	755.0946	506.0256	330.5996	347.2421	544.6396	827.9880	1105.2140	1339.0303	(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	674.0638	542.0538	478.5002	306.0438	165.1357	0.0000	0.0000	0.0000	0.0000	285.8772	490.3494	686.3412	(98)
Space heating												3628.3651	(98)
Space heating per m2												43.0922	(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	866.9570	682.4981	699.6290	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7580	0.8318	0.8048	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	657.1549	567.6996	563.0843	0.0000	0.0000	0.0000	0.0000	(102)

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Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	815.9544	781.1818	741.7835	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	114.3357	158.8307	132.9522	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												406.1186 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	28.5839	39.7077	33.2381	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												101.5297 (107)
Space cooling per m2												1.2058 (108)
Energy for space heating												43.0922 (99)
Energy for space cooling												1.2058 (108)
Total												44.2980 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (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																3 * 10 =	30.0000 (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) =					30.0000	/ (5) =	0.1408 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3908 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3615 (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	0.4609	0.4519	0.4429	0.3977	0.3886	0.3434	0.3434	0.3344	0.3615	0.3886	0.4067	0.4248	(22b)				
Effective ac	0.6062	0.6021	0.5981	0.5791	0.5755	0.5590	0.5590	0.5559	0.5653	0.5755	0.5827	0.5902	(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)			12.0300	1.3258	15.9489		(27)					
Ground Floor			42.1000	0.1300	5.4730		(28a)					
Brick and Block	93.4600	14.1500	79.3100	0.1800	14.2758		(29a)					
Pitched Roof	42.1000		42.1000	0.1300	5.4730		(30)					
Total net area of external elements Aum(A, m2)			177.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	43.2907		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4553 (36)					
Total fabric heat loss						(33) + (36) =	52.7460 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.6171	Feb 42.3271	Mar 42.0428	Apr 40.7078	May 40.4580	Jun 39.2952	Jul 39.2952	Aug 39.0799	Sep 39.7431	Oct 40.4580	Nov 40.9633	Dec 41.4916 (38)
Heat transfer coeff	95.3630	95.0730	94.7888	93.4537	93.2040	92.0411	92.0411	91.8258	92.4890	93.2040	93.7093	94.2376 (39)
Average = Sum(39)m / 12 =												93.4525 (39)
HLP	Jan 1.1326	Feb 1.1291	Mar 1.1258	Apr 1.1099	May 1.1069	Jun 1.0931	Jul 1.0931	Aug 1.0906	Sep 1.0984	Oct 1.1069	Nov 1.1129	Dec 1.1192 (40)
HLP (average)												1.1099 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy conte	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Energy content (annual)										Total = Sum(45)m =		1486.4016 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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)
	32.7480	28.6416	29.5555	25.7672	24.7243	21.3352	19.7702	22.6866	22.9575	26.7548	29.2049	31.7147 (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	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	126.8870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.7101	19.2827	15.6818	11.8721	8.8745	7.4923	8.0957	10.5230	14.1240	17.9337	20.9312	22.3135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.9943	230.3601	224.3982	211.7060	195.6844	180.6263	170.5666	168.2008	174.1627	186.8549	202.8765	217.9346	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	35.6887	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	44.0161	42.6214	39.7252	35.7878	33.2316	29.6322	26.5728	30.4927	31.8854	35.9607	40.5624	42.6272	(72)
Total internal gains	354.7865	353.3303	340.8713	320.4320	298.8566	278.8169	266.3012	270.2826	281.2382	301.8153	325.4362	343.9414	(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				7.3800	10.6334	0.6300		0.7000		0.7700		23.9828 (74)	
South				4.6500	46.7521	0.6300		0.7000		0.7700		66.4394 (78)	
Solar gains	90.4222	154.6430	216.4858	281.7501	331.7590	337.5005	321.9231	282.6913	238.4272	171.9199	108.3392	77.4030 (83)	
Total gains	445.2087	507.9733	557.3570	602.1821	630.6155	616.3173	588.2243	552.9739	519.6654	473.7352	433.7754	421.3444 (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	61.3154	61.5024	61.6868	62.5681	62.7358	63.5283	63.5283	63.6773	63.2207	62.7358	62.3975	62.0477		
alpha	5.0877	5.1002	5.1125	5.1712	5.1824	5.2352	5.2352	5.2452	5.2147	5.1824	5.1598	5.1365		
util living area	0.9989	0.9976	0.9941	0.9817	0.9391	0.8200	0.6548	0.7099	0.9118	0.9873	0.9977	0.9992	(86)	
MIT	19.7156	19.8536	20.0809	20.3936	20.6913	20.9057	20.9777	20.9664	20.8149	20.4361	20.0233	19.6964	(87)	
Th 2	19.9743	19.9771	19.9799	19.9928	19.9952	20.0065	20.0065	20.0085	20.0021	19.9952	19.9903	19.9852	(88)	
util rest of house	0.9985	0.9967	0.9918	0.9738	0.9105	0.7385	0.5236	0.5822	0.8590	0.9805	0.9967	0.9989	(89)	
MIT 2	18.7992	18.9391	19.1677	19.4869	19.7715	19.9586	20.0002	19.9979	19.8901	19.5330	19.1193	18.7887	(90)	
Living area fraction														
MIT	18.9971	19.1365	19.3649	19.6827	19.9701	20.1631	20.2113	20.2070	20.0898	19.7280	19.3145	18.9847	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.9971	19.1365	19.3649	19.6827	19.9701	20.1631	20.2113	20.2070	20.0898	19.7280	19.3145	18.9847	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	444.3194	505.8261	551.7833	584.5364	573.6098	464.1240	324.8889	337.2766	449.3425	463.3562	431.9675	420.7125	(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	1401.5573	1353.5101	1219.4448	1007.6792	770.8038	512.0338	332.3841	349.5817	553.9886	850.7621	1144.6122	1393.2727	(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	712.1850	569.6437	496.7402	304.6628	146.7123	0.0000	0.0000	0.0000	0.0000	288.2300	513.1041	723.5848	(98)
Space heating												3754.8629	(98)
Space heating per m2											(98) / (4) =	44.5946	(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	865.1868	681.1045	697.8762	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8140	0.8912	0.8644	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	704.3037	607.0228	603.2126	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	815.9544	781.1818	741.7835	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	80.3885	129.5743	103.0968	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												313.0595	(104)
Cooled fraction												1.0000	(105)
												fC = cooled area / (4) =	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	20.0971	32.3936	25.7742	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											78.2649 (107)
Space cooling per m2											0.9295 (108)
Energy for space heating											44.5946 (99)
Energy for space cooling											0.9295 (108)
Total											45.5241 (109)
Target Fabric Energy Efficiency (TFEE)											52.4 (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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1900
Infiltration rate					0.2095 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1938 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2277	0.2132	0.2132	0.1938	0.1986	0.1889	0.1889	0.1841	0.1841	0.1986	0.1938	0.1986 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.0300	1.1450	13.7748		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.4600	14.1500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4032		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			73.3100			9.0000	659.7900 (32c)
First Floor			83.3600			9.0000	750.2400 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13296.7082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.9181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3458 (36)
Total fabric heat loss						(33) + (36) =	53.7490 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493 (38)
Average = Sum(39)m / 12 =	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy conte	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy content (annual)	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2047	30.1650	31.1464	30.1139	31.1004	31.1302	30.1417	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (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	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (64)
RHI water heating demand	59.0516	51.8684	54.0469	47.8594	46.4728	40.9117	38.7096	43.2804	43.4572	49.6585	53.2503	57.4325 (65)
Heat gains from water heating, kWh/month												1853 (64)
												1853 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.2753	48.2068	39.2044	29.6803	22.1863	18.7306	20.2391	26.3076	35.3100	44.8341	52.3281	55.7837 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.2899	343.8211	334.9227	315.9791	292.0663	269.5916	254.5771	251.0459	259.9443	278.8879	302.8007	325.2754 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642 (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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096 (71)
Water heating gains (Table 5)	79.3705	77.1851	72.6437	66.4714	62.4635	56.8219	52.0290	58.1725	60.3572	66.7453	73.9588	77.1942 (72)
Total internal gains	580.4547	575.7320	553.2898	518.6497	483.2351	451.6630	433.3642	442.0450	462.1304	496.9862	535.6065	564.7724 (73)

6. Solar gains

[Jan]													Gains
	Area m2				Solar flux Table 6a W/m2		Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		W
North	7.3800				13.4684		0.6300		0.7000		0.7700		30.3770 (74)
South	4.6500				56.5862		0.6300		0.7000		0.7700		80.4147 (78)
Solar gains	110.7917	161.6990	232.1144	306.4611	341.9991	385.8868	353.3102	322.0428	268.7085	194.4031	132.3862	89.7421 (83)	
Total gains	691.2464	737.4310	785.4042	825.1109	825.2342	837.5499	786.6744	764.0878	730.8389	691.3893	667.9927	654.5145 (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	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478
alpha	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699
util living area	0.9608	0.9491	0.9179	0.8487	0.7224	0.5154	0.3672	0.3666	0.6204	0.8401	0.9344	0.9660 (86)
MIT	19.8633	19.9782	20.2415	20.5667	20.8289	20.9650	20.9927	20.9930	20.9283	20.6607	20.2289	19.8262 (87)
Th 2	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371 (88)
util rest of house	0.9528	0.9387	0.9008	0.8164	0.6634	0.4278	0.2628	0.2591	0.5337	0.7983	0.9186	0.9588 (89)
MIT 2	19.0295	19.1411	19.3950	19.6989	19.9255	20.0218	20.0355	20.0356	20.0013	19.7893	19.3871	18.9938 (90)
Living area fraction	19.2095	19.3218	19.5778	19.8862	20.1205	20.2255	20.2422	20.2423	20.2015	19.9775	19.5688	0.2159 (91)
MIT	19.2095	19.3218	19.5778	19.8862	20.1205	20.2255	20.2422	20.2423	20.2015	19.9775	19.5688	19.1735 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2095	19.3218	19.5778	19.8862	20.1205	20.2255	20.2422	20.2423	20.2015	19.9775	19.5688	19.1735 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	652.6588	685.3449	699.9702	668.9555	552.0287	373.1973	224.5272	215.7612	401.5131	549.9147	607.4858	622.2921 (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	1209.8623	1184.2868	1064.8065	869.9795	624.1125	384.5276	225.9928	217.1181	426.8410	700.2930	975.1085	1197.7738 (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	414.5594	335.2890	271.4382	144.7373	53.6304	0.0000	0.0000	0.0000	0.0000	111.8814	264.6883	428.1583 (98)
Space heating												2024.3824 (98)
RHI space heating demand												2024 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											4.1900	
Infiltration rate											0.2095 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1938 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.2471	0.2422	0.2374	0.2132	0.2083	0.1841	0.1841	0.1793	0.1938	0.2083	0.2180	0.2277 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.0300	1.1450	13.7748		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.4600	14.1500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4032		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			73.3100			9.0000	659.7900 (32c)
First Floor			83.3600			9.0000	750.2400 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13296.7082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.9181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3458 (36)
Total fabric heat loss						(33) + (36) =	53.7490 (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	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493 (38)
Heat transfer coeff	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983 (39)
Average = Sum(39)m / 12 =												88.8983 (39)
HLP	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558 (40)
HLP (average)												1.0558 (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	2.5377 (42)
Average daily hot water use (litres/day)	94.4713 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy content (annual)	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2047	30.1650	31.1464	30.1139	31.1004	31.1302	30.1417	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (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	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (64)
Heat gains from water heating, kWh/month	59.0516	51.8684	54.0469	47.8594	46.4728	40.9117	38.7096	43.2804	43.4572	49.6585	53.2503	57.4325 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	54.2753	48.2068	39.2044	29.6803	22.1863	18.7306	20.2391	26.3076	35.3100	44.8341	52.3281	55.7837 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	340.2899	343.8211	334.9227	315.9791	292.0663	269.5916	254.5771	251.0459	259.9443	278.8879	302.8007	325.2754 (68)
Pumps, fans	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096 (71)
Total internal gains	79.3705	77.1851	72.6437	66.4714	62.4635	56.8219	52.0290	58.1725	60.3572	66.7453	73.9588	77.1942 (72)
	580.4547	575.7320	553.2898	518.6497	483.2351	451.6630	433.3642	442.0450	462.1304	496.9862	535.6065	564.7724 (73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access		Gains
				m2	Table 6a	Specific data		Specific data		factor		W
					W/m2	or Table 6b		or Table 6c		Table 6d		
North				7.3800	10.6334	0.6300		0.7000		0.7700		23.9828 (74)
South				4.6500	46.7521	0.6300		0.7000		0.7700		66.4394 (78)
Solar gains	90.4222	154.6430	216.4858	281.7501	331.7590	337.5005	321.9231	282.6913	238.4272	171.9199	108.3392	77.4030 (83)
Total gains	670.8769	730.3749	769.7756	800.3998	814.9940	789.1635	755.2873	724.7363	700.5576	668.9061	643.9457	642.1754 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478
util living area	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699
MIT	0.9719	0.9596	0.9369	0.8889	0.7960	0.6468	0.4960	0.5338	0.7349	0.8962	0.9570	0.9759 (86)
Th 2	19.6574	19.8222	20.0843	20.4127	20.7129	20.9056	20.9734	20.9645	20.8411	20.4758	20.0011	19.6022 (87)
util rest of house	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371 (88)
MIT 2	0.9664	0.9517	0.9241	0.8652	0.7513	0.5711	0.3965	0.4341	0.6672	0.8694	0.9473	0.9711 (89)
Living area fraction	18.8266	18.9880	19.2436	19.5572	19.8293	19.9844	20.0273	20.0230	19.9397	19.6220	19.1661	18.7724 (90)
MIT	19.0059	19.1681	19.4251	19.7419	20.0201	20.1833	20.2316	20.2263	20.1343	19.8063	19.3464	18.9515 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0059	19.1681	19.4251	19.7419	20.0201	20.1833	20.2316	20.2263	20.1343	19.8063	19.3464	18.9515 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9589	0.9429	0.9144	0.8568	0.7504	0.5833	0.4173	0.4546	0.6747	0.8618	0.9386	0.9642 (94)
Ext temp.	643.3258	688.7066	703.9053	685.7943	611.5849	460.3392	315.2038	329.4355	472.6354	576.4744	604.3779	619.2034 (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	1307.3334	1268.4097	1149.0227	963.8284	739.6405	496.3478	322.8398	340.1504	536.4402	818.4264	1088.6846	1311.3872 (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	494.0217	389.5605	331.1673	200.1845	95.2734	0.0000	0.0000	0.0000	0.0000	180.0123	348.7008	514.9848 (98)
Space heating per m2												2553.9053 (98)
												(98) / (4) = 30.3314 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2815.7721 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	494.0217	389.5605	331.1673	200.1845	95.2734	0.0000	0.0000	0.0000	0.0000	180.0123	348.7008	514.9848	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	544.6766	429.5044	365.1239	220.7106	105.0423	0.0000	0.0000	0.0000	0.0000	198.4700	384.4551	567.7891	(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	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791	(64)
Efficiency of water heater	89.6597	89.5762	89.4087	89.0687	88.4155	87.0000	87.0000	87.0000	87.0000	88.9374	89.4647	87.0000	(216)
(217)m	89.6597	89.5762	89.4087	89.0687	88.4155	87.0000	87.0000	87.0000	87.0000	88.9374	89.4647	89.7099	(217)
Fuel for water heating, kWh/month	206.7272	181.9622	190.4620	170.0065	166.8214	150.0169	142.6856	158.4948	158.8242	176.6246	187.3899	201.1808	(219)
Water heating fuel used												2091.1962	(219)
Annual totals kWh/year													
Space heating fuel - main system												2815.7721	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4200)													
mechanical ventilation fans (SFP = 0.4200)												109.1545	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												184.1545	(231)
Electricity for lighting (calculated in Appendix L)												383.4073	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.62 * 1080 * 1.00) =										-535.4442		-535.4442	(233)
Total delivered energy for all uses												4939.0859	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2815.7721	3.4800	97.9889	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2091.1962	3.4800	72.7736	(247)
Mechanical ventilation fans	109.1545	13.1900	14.3975	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	383.4073	13.1900	50.5714	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-535.4442	13.1900	-70.6251	(252)
Total energy cost			294.9988	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200	(256)
Energy cost factor (ECF)				
		$[(255) \times (256)] / [(4) + 45.0] =$	0.9590	(257)
SAP value			86.6223	
SAP rating (Section 12)			87	(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	2815.7721	0.2160	608.2068	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2091.1962	0.2160	451.6984	(264)
Space and water heating			1059.9051	(265)
Pumps and fans	184.1545	0.5190	95.5762	(267)
Energy for lighting	383.4073	0.5190	198.9884	(268)
Energy saving/generation technologies				
PV Unit	-535.4442	0.5190	-277.8955	(269)
Total kg/year			1076.5742	(272)
CO2 emissions per m2			12.7900	(273)
EI value			88.8343	
EI rating			89	(274)
EI band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8852 = 3.931$, stars = 4
Water heating environmental impact	$0.216 / 0.8852 = 0.2440$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1900
Infiltration rate					0.2095 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1938 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2277	0.2132	0.2132	0.1938	0.1986	0.1889	0.1889	0.1841	0.1841	0.1986	0.1938	0.1986 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.0300	1.1450	13.7748		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.4600	14.1500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.6600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.4032		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			73.3100			9.0000	659.7900 (32c)
First Floor			83.3600			9.0000	750.2400 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13296.7082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.9181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3458 (36)
Total fabric heat loss						(33) + (36) =	53.7490 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493 (38)
Average = Sum(39)m / 12 =	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy content (annual)	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2047	30.1650	31.1464	30.1139	31.1004	31.1302	30.1417	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (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	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (64)
Heat gains from water heating, kWh/month	59.0516	51.8684	54.0469	47.8594	46.4728	40.9117	38.7096	43.2804	43.4572	49.6585	53.2503	57.4325 (65)
Total per year (kWh/year) = Sum(64)m =												1853.4849 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	54.2753	48.2068	39.2044	29.6803	22.1863	18.7306	20.2391	26.3076	35.3100	44.8341	52.3281	55.7837 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	340.2899	343.8211	334.9227	315.9791	292.0663	269.5916	254.5771	251.0459	259.9443	278.8879	302.8007	325.2754 (68)
Pumps, fans	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096 (71)
Total internal gains	79.3705	77.1851	72.6437	66.4714	62.4635	56.8219	52.0290	58.1725	60.3572	66.7453	73.9588	77.1942 (72)
	580.4547	575.7320	553.2898	518.6497	483.2351	451.6630	433.3642	442.0450	462.1304	496.9862	535.6065	564.7724 (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				7.3800	13.4684	0.6300	0.7000	0.7700	30.3770 (74)			
South				4.6500	56.5862	0.6300	0.7000	0.7700	80.4147 (78)			
Solar gains	110.7917	161.6990	232.1144	306.4611	341.9991	385.8868	353.3102	322.0428	268.7085	194.4031	132.3862	89.7421 (83)
Total gains	691.2464	737.4310	785.4042	825.1109	825.2342	837.5499	786.6744	764.0878	730.8389	691.3893	667.9927	654.5145 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478
util living area	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699
MIT	0.9608	0.9491	0.9179	0.8487	0.7224	0.5154	0.3672	0.3666	0.6204	0.8401	0.9344	0.9660 (86)
Th 2	19.8633	19.9782	20.2415	20.5667	20.8289	20.9650	20.9927	20.9930	20.9283	20.6607	20.2289	19.8262 (87)
util rest of house	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371 (88)
MIT 2	0.9528	0.9387	0.9008	0.8164	0.6634	0.4278	0.2628	0.2591	0.5337	0.7983	0.9186	0.9588 (89)
Living area fraction	19.0295	19.1411	19.3950	19.6989	19.9255	20.0218	20.0355	20.0356	20.0013	19.7893	19.3871	18.9938 (90)
MIT	19.2095	19.3218	19.5778	19.8862	20.1205	20.2255	20.2422	20.2423	20.2015	19.9775	19.5688	19.1735 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2095	19.3218	19.5778	19.8862	20.1205	20.2255	20.2422	20.2423	20.2015	19.9775	19.5688	19.1735 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9442	0.9294	0.8912	0.8107	0.6689	0.4456	0.2854	0.2824	0.5494	0.7954	0.9094	0.9508 (94)
Ext temp.	652.6588	685.3449	699.9702	668.9555	552.0287	373.1973	224.5272	215.7612	401.5131	549.9147	607.4858	622.2921 (95)
Heat loss rate W	5.6000	6.0000	7.6000	10.1000	13.1000	15.9000	17.7000	17.8000	15.4000	12.1000	8.6000	5.7000 (96)
Month fracti	1209.8623	1184.2868	1064.8065	869.9795	624.1125	384.5276	225.9928	217.1181	426.8410	700.2930	975.1085	1197.7738 (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	414.5594	335.2890	271.4382	144.7373	53.6304	0.0000	0.0000	0.0000	0.0000	111.8814	264.6883	428.1583 (98)
Space heating per m2												2024.3824 (98)
												(98) / (4) = 24.0425 (99)

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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 %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2231.9541	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	414.5594	335.2890	271.4382	144.7373	53.6304	0.0000	0.0000	0.0000	0.0000	111.8814	264.6883	428.1583	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	457.0666	369.6681	299.2704	159.5781	59.1294	0.0000	0.0000	0.0000	0.0000	123.3532	291.8284	472.0599	(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	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791	(64)	
Efficiency of water heater	89.5237	89.4555	89.2369	88.7698	87.9568	87.0000	87.0000	87.0000	87.0000	88.5018	89.2285	87.0000	(216)	
(217)m	89.5237	89.4555	89.2369	88.7698	87.9568	87.0000	87.0000	87.0000	87.0000	88.5018	89.2285	89.5704	(217)	
Fuel for water heating, kWh/month	207.0413	182.2077	190.8286	170.5790	167.6914	150.0169	142.6856	158.4948	158.8242	177.4940	187.8859	201.4940	(219)	
Water heating fuel used												2095.2436	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2231.9541	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)														
mechanical ventilation fans (SFP = 0.4200)												109.1545	(230a)	
central heating pump												30.0000	(230c)	
main heating flue fan												45.0000	(230e)	
Total electricity for the above, kWh/year												184.1545	(231)	
Electricity for lighting (calculated in Appendix L)												383.4073	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.62 * 1206 * 1.00) =										-598.1811		-598.1811	(233)	
Total delivered energy for all uses												4296.5784	(238)	

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2231.9541	3.6300	81.0199 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2095.2436	3.6300	76.0573 (247)
Mechanical ventilation fans	109.1545	19.4400	21.2196 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	383.4073	19.4400	74.5344 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-598.1811	19.4400	-116.2864 (252)
Total energy cost			246.1249 (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	2231.9541	0.2160	482.1021 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2095.2436	0.2160	452.5726 (264)
Space and water heating			934.6747 (265)
Pumps and fans	184.1545	0.5190	95.5762 (267)
Energy for lighting	383.4073	0.5190	198.9884 (268)
Energy saving/generation technologies			
PV Unit	-598.1811	0.5190	-310.4560 (269)
Total kg/year			918.7833 (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	2231.9541	1.2200	2722.9840 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2095.2436	1.2200	2556.1972 (264)
Space and water heating			5279.1812 (265)
Pumps and fans	184.1545	3.0700	565.3544 (267)
Energy for lighting	383.4073	3.0700	1177.0604 (268)
Energy saving/generation technologies			

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PV Unit	-598.1811	3.0700	-1836.4159 (269)
Primary energy kWh/year			5185.1801 (272)
Primary energy kWh/m2/year			61.5817 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 87
Current environmental impact rating:	B 89

(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	+ 1.2	-£ 27	-192 kg (20.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£27 2.28 kg/m²	B 88	B 91
Total Savings	£27 2.28 kg/m²		
Potential energy efficiency rating:		B 88	
Potential environmental impact rating:			B 91

Fuel prices for cost data on this page from database revision number 490 TEST (31 Jan 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	£110	£120	-£10
Mains gas	£252	£215	£37
Space heating	£212	£212	£0
Water heating	£76	£49	£27
Lighting	£75	£75	£0
Generated (PV)	-£116	-£116	£0
Total cost of fuels	£246	£219	£27
Total cost of uses	£247	£220	£27
Delivered energy	51 kWh/m²	40 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	9 kg/m²	2 kg/m²
Primary energy	62 kWh/m²	49 kWh/m²	13 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	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												4.1900
Infiltration rate												0.2095 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1938 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.2471	0.2422	0.2374	0.2132	0.2083	0.1841	0.1841	0.1793	0.1938	0.2083	0.2180	0.2277 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.0300	1.1450	13.7748		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.4600	14.1500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.6600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.4032		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			73.3100			9.0000	659.7900 (32c)
First Floor			83.3600			9.0000	750.2400 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13296.7082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.9181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3458 (36)
Total fabric heat loss						(33) + (36) =	53.7490 (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	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493 (38)
Heat transfer coeff	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983 (39)
Average = Sum(39)m / 12 =												88.8983 (39)
HLP	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558 (40)
HLP (average)												1.0558 (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	2.5377 (42)
Average daily hot water use (litres/day)	94.4713 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy content (annual)	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1486.4016 (45)
	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2047	30.1650	31.1464	30.1139	31.1004	31.1302	30.1417	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (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												1.2201 (H8)
Utilisation factor												0.5594 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4713 (H14)
Volume ratio Veff/V												0.7939 (H15)
Solar storage volume factor												0.9538 (H16)
Solar input												-850.8674 (H17)
Solar input	-24.6735	-41.1729	-70.1222	-93.9775	-116.1013	-114.1461	-112.6376	-98.4121	-77.0764	-52.6341	-29.2663	-20.6475 (63)
												-850.8674 (63)
Output from w/h	160.6775	121.8220	100.1674	57.4450	31.3946	16.3686	11.4989	39.4785	61.1007	104.4513	138.3815	159.8316 (64)
												Total per year (kWh/year) = Sum (64)m = 1002.6175 (64)
Heat gains from water heating, kWh/month	59.0516	51.8684	54.0469	47.8594	46.4728	40.9117	38.7096	43.2804	43.4572	49.6585	53.2503	57.4325 (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	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.2753	48.2068	39.2044	29.6803	22.1863	18.7306	20.2391	26.3076	35.3100	44.8341	52.3281	55.7837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.2899	343.8211	334.9227	315.9791	292.0663	269.5916	254.5771	251.0459	259.9443	278.8879	302.8007	325.2754	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	(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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	(71)
Water heating gains (Table 5)	79.3705	77.1851	72.6437	66.4714	62.4635	56.8219	52.0290	58.1725	60.3572	66.7453	73.9588	77.1942	(72)
Total internal gains	580.4547	575.7320	553.2898	518.6497	483.2351	451.6630	433.3642	442.0450	462.1304	496.9862	535.6065	564.7724	(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				7.3800	10.6334	0.6300		0.7000		0.7700	23.9828 (74)				
South				4.6500	46.7521	0.6300		0.7000		0.7700	66.4394 (78)				
Solar gains				90.4222	154.6430	216.4858	281.7501	331.7590	337.5005	321.9231	282.6913	238.4272	171.9199	108.3392	77.4030 (83)
Total gains				670.8769	730.3749	769.7756	800.3998	814.9940	789.1635	755.2873	724.7363	700.5576	668.9061	643.9457	642.1754 (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	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	
alpha	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	
util living area	0.9719	0.9596	0.9369	0.8889	0.7960	0.6468	0.4960	0.5338	0.7349	0.8962	0.9570	0.9759	(86)
MIT	19.6574	19.8222	20.0843	20.4127	20.7129	20.9056	20.9734	20.9645	20.8411	20.4758	20.0011	19.6022	(87)
Th 2	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	(88)
util rest of house	0.9664	0.9517	0.9241	0.8652	0.7513	0.5711	0.3965	0.4341	0.6672	0.8694	0.9473	0.9711	(89)
MIT 2	18.8266	18.9880	19.2436	19.5572	19.8293	19.9844	20.0273	20.0230	19.9397	19.6220	19.1661	18.7724	(90)
Living area fraction									fLA = Living area / (4) =			0.2159	(91)
MIT	19.0059	19.1681	19.4251	19.7419	20.0201	20.1833	20.2316	20.2263	20.1343	19.8063	19.3464	18.9515	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0059	19.1681	19.4251	19.7419	20.0201	20.1833	20.2316	20.2263	20.1343	19.8063	19.3464	18.9515	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9589	0.9429	0.9144	0.8568	0.7504	0.5833	0.4173	0.4546	0.6747	0.8618	0.9386	0.9642	(94)
Useful gains	643.3258	688.7066	703.9053	685.7943	611.5849	460.3392	315.2038	329.4355	472.6354	576.4744	604.3779	619.2034	(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	1307.3334	1268.4097	1149.0227	963.8284	739.6405	496.3478	322.8398	340.1504	536.4402	818.4264	1088.6846	1311.3872	(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	494.0217	389.5605	331.1673	200.1845	95.2734	0.0000	0.0000	0.0000	0.0000	180.0123	348.7008	514.9848	(98)
Space heating												2553.9053	(98)
Space heating per m2											(98) / (4) =	30.3314	(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 %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2815.7721	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	494.0217	389.5605	331.1673	200.1845	95.2734	0.0000	0.0000	0.0000	0.0000	180.0123	348.7008	514.9848	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	544.6766	429.5044	365.1239	220.7106	105.0423	0.0000	0.0000	0.0000	0.0000	198.4700	384.4551	567.7891	(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	160.6775	121.8220	100.1674	57.4450	31.3946	16.3686	11.4989	39.4785	61.1007	104.4513	138.3815	159.8316	(64)	
Efficiency of water heater	89.7631	89.7903	89.8130	89.8480	89.7539	87.0000	87.0000	87.0000	87.0000	89.3054	89.6172	87.0000	(216)	
(217)m	89.7631	89.7903	89.8130	89.8480	89.7539	87.0000	87.0000	87.0000	87.0000	89.3054	89.6172	87.0000	(217)	
Fuel for water heating, kWh/month	179.0017	135.6739	111.5289	63.9358	34.9785	18.8145	13.2171	45.3775	70.2307	116.9596	154.4140	177.9951	(219)	
Water heating fuel used												1122.1274	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2815.7721	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)														
mechanical ventilation fans (SFP = 0.4200)													109.1545	(230a)
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													234.1545	(231)
Electricity for lighting (calculated in Appendix L)													383.4073	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.62 * 1080 * 1.00) =										-535.4442			-535.4442	(233)
Total delivered energy for all uses													4020.0170	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2815.7721	3.4800	97.9889	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1122.1274	3.4800	39.0500	(247)
Mechanical ventilation fans	109.1545	13.1900	14.3975	(249)
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	383.4073	13.1900	50.5714	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-535.4442	13.1900	-70.6251	(252)
Total energy cost			267.8702	(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] =	0.8708	(257)
SAP value		87.8525	
SAP rating (Section 12)		88	(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	2815.7721	0.2160	608.2068	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1122.1274	0.2160	242.3795	(264)
Space and water heating			850.5863	(265)
Pumps and fans	234.1545	0.5190	121.5262	(267)
Energy for lighting	383.4073	0.5190	198.9884	(268)
Energy saving/generation technologies				
PV Unit	-535.4442	0.5190	-277.8955	(269)
Total kg/year			893.2053	(272)
CO2 emissions per m2			10.6100	(273)
EI value			90.7361	
EI rating			91	(274)
EI band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.1000 (1b)	x 2.3900 (2b)	= 100.6190 (1b) - (3b)
First floor	42.1000 (1c)	x 2.6700 (2c)	= 112.4070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.0260 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.1900
Infiltration rate					0.2095 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.1938 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.7000	4.4000	4.4000	4.0000	4.1000	3.9000	3.9000	3.8000	3.8000	4.1000	4.0000	4.1000 (22)
Wind factor	1.1750	1.1000	1.1000	1.0000	1.0250	0.9750	0.9750	0.9500	0.9500	1.0250	1.0000	1.0250 (22a)
Adj infilt rate	0.2277	0.2132	0.2132	0.1938	0.1986	0.1889	0.1889	0.1841	0.1841	0.1986	0.1938	0.1986 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			12.0300	1.1450	13.7748		(27)
Ground Floor			42.1000	0.1200	5.0520	84.0000	3536.4000 (28a)
Brick and Block	93.4600	14.1500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	42.1000		42.1000	0.1000	4.2100	9.1000	383.1100 (30)
Total net area of external elements Aum(A, m ²)			177.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4032		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			73.3100			9.0000	659.7900 (32c)
First Floor			83.3600			9.0000	750.2400 (32c)
Internal Floor 1			42.1000			18.0000	757.8000 (32d)
Internal Ceiling 1			42.1000			18.0000	757.8000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13296.7082 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.9181 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3458 (36)
Total fabric heat loss						(33) + (36) =	53.7490 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493	35.1493 (38)
Average = Sum(39)m / 12 =	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983	88.8983 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558	1.0558 (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												2.5377 (42)
Average daily hot water use (litres/day)												94.4713 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy conte	103.9184	100.1396	96.3607	92.5819	88.8030	85.0242	85.0242	88.8030	92.5819	96.3607	100.1396	103.9184 (44)
Energy content (annual)	154.1080	134.7839	139.0849	121.2576	116.3495	100.4008	93.0361	106.7603	108.0353	125.9048	137.4349	149.2454 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1486.4016 (45)
	23.1162	20.2176	20.8627	18.1886	17.4524	15.0601	13.9554	16.0140	16.2053	18.8857	20.6152	22.3868 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	31.2429	28.2110	31.2047	30.1650	31.1464	30.1139	31.1004	31.1302	30.1417	31.1806	30.2128	31.2337 (61)
Total heat required for water heating calculated for each month	185.3509	162.9949	170.2896	151.4226	147.4959	130.5147	124.1365	137.8905	138.1771	157.0854	167.6477	180.4791 (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												1.3631 (H8)
Utilisation factor												0.5198 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.4713 (H14)
Volume ratio Veff/V												0.7939 (H15)
Solar storage volume factor												0.9538 (H16)
Solar input	-28.8250	-40.9924	-71.1324	-95.6850	-111.1925	-120.9452	-114.6745	-104.5720	-81.8483	-56.5706	-34.0934	-883.3553 (H17)
Solar input (sum of months) = Sum (63)m =												-22.8241 (63)
												-883.3553 (63)
Output from w/h	156.5259	122.0025	99.1573	55.7375	36.3035	9.5695	9.4620	33.3185	56.3288	100.5148	133.5543	157.6550 (64)
Total per year (kWh/year) = Sum (64)m =												970.1296 (64)
Heat gains from water heating, kWh/month	59.0516	51.8684	54.0469	47.8594	46.4728	40.9117	38.7096	43.2804	43.4572	49.6585	53.2503	57.4325 (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	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644	152.2644 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.2753	48.2068	39.2044	29.6803	22.1863	18.7306	20.2391	26.3076	35.3100	44.8341	52.3281	55.7837 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.2899	343.8211	334.9227	315.9791	292.0663	269.5916	254.5771	251.0459	259.9443	278.8879	302.8007	325.2754 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642	52.7642 (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)	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096	-101.5096 (71)
Water heating gains (Table 5)	79.3705	77.1851	72.6437	66.4714	62.4635	56.8219	52.0290	58.1725	60.3572	66.7453	73.9588	77.1942 (72)
Total internal gains	580.4547	575.7320	553.2898	518.6497	483.2351	451.6630	433.3642	442.0450	462.1304	496.9862	535.6065	564.7724 (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					7.3800	13.4684		0.6300	0.7000	0.7700	30.3770 (74)	
South					4.6500	56.5862		0.6300	0.7000	0.7700	80.4147 (78)	

Solar gains	110.7917	161.6990	232.1144	306.4611	341.9991	385.8868	353.3102	322.0428	268.7085	194.4031	132.3862	89.7421 (83)
Total gains	691.2464	737.4310	785.4042	825.1109	825.2342	837.5499	786.6744	764.0878	730.8389	691.3893	667.9927	654.5145 (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	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478	41.5478
alpha	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699	3.7699
util living area	0.9608	0.9491	0.9179	0.8487	0.7224	0.5154	0.3672	0.3666	0.6204	0.8401	0.9344	0.9660 (86)
MIT	19.8633	19.9782	20.2415	20.5667	20.8289	20.9650	20.9927	20.9930	20.9283	20.6607	20.2289	19.8262 (87)
Th 2	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371	20.0371 (88)
util rest of house	0.9528	0.9387	0.9008	0.8164	0.6634	0.4278	0.2628	0.2591	0.5337	0.7983	0.9186	0.9588 (89)
MIT 2	19.0295	19.1411	19.3950	19.6989	19.9255	20.0218	20.0355	20.0356	20.0013	19.7893	19.3871	18.9938 (90)
Living area fraction										fLA = Living area / (4) =		0.2159 (91)
MIT	19.2095	19.3218	19.5778	19.8862	20.1205	20.2255	20.2422	20.2423	20.2015	19.9775	19.5688	19.1735 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2095	19.3218	19.5778	19.8862	20.1205	20.2255	20.2422	20.2423	20.2015	19.9775	19.5688	19.1735 (93)

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Calculation Type: New Build (As Built)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9442	0.9294	0.8912	0.8107	0.6689	0.4456	0.2854	0.2824	0.5494	0.7954	0.9094	0.9508	(94)
Useful gains	652.6588	685.3449	699.9702	668.9555	552.0287	373.1973	224.5272	215.7612	401.5131	549.9147	607.4858	622.2921	(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	1209.8623	1184.2868	1064.8065	869.9795	624.1125	384.5276	225.9928	217.1181	426.8410	700.2930	975.1085	1197.7738	(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	414.5594	335.2890	271.4382	144.7373	53.6304	0.0000	0.0000	0.0000	0.0000	111.8814	264.6883	428.1583	(98)
Space heating												2024.3824	(98)
Space heating per m2											(98) / (4) =	24.0425	(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 %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2231.9541	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	414.5594	335.2890	271.4382	144.7373	53.6304	0.0000	0.0000	0.0000	0.0000	111.8814	264.6883	428.1583	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	457.0666	369.6681	299.2704	159.5781	59.1294	0.0000	0.0000	0.0000	0.0000	123.3532	291.8284	472.0599	(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	156.5259	122.0025	99.1573	55.7375	36.3035	9.5695	9.4620	33.3185	56.3288	100.5148	133.5543	157.6550	(64)	
Efficiency of water heater	(217)m	89.6549	89.6824	89.6795	89.6401	89.1692	87.0000	87.0000	87.0000	87.0000	88.9106	89.4246	87.0000	(216)
Fuel for water heating, kWh/month	174.5871	136.0383	110.5684	62.1793	40.7130	10.9995	10.8759	38.2971	64.7458	113.0516	149.3485	175.8097	(219)	
Water heating fuel used												1087.2142	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2231.9541	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4200)														
mechanical ventilation fans (SFP = 0.4200)													109.1545	(230a)
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													234.1545	(231)
Electricity for lighting (calculated in Appendix L)													383.4073	(232)
Energy saving/generation technologies (Appendices M, N and Q)														
PV Unit 0 (0.80 * 0.62 * 1206 * 1.00) =										-598.1811			-598.1811	(233)
Total delivered energy for all uses													3338.5490	(238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2231.9541	3.6300	81.0199	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1087.2142	3.6300	39.4659	(247)
Mechanical ventilation fans	109.1545	19.4400	21.2196	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Pump for solar water heating	50.0000	19.4400	9.7200	(249)
Energy for lighting	383.4073	19.4400	74.5344	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-598.1811	19.4400	-116.2864	(252)
Total energy cost			219.2534	(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	2231.9541	0.2160	482.1021	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1087.2142	0.2160	234.8383	(264)
Space and water heating			716.9404	(265)
Pumps and fans	234.1545	0.5190	121.5262	(267)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy for lighting	383.4073	0.5190	198.9884 (268)
Energy saving/generation technologies			
PV Unit	-598.1811	0.5190	-310.4560 (269)
Total kg/year			726.9990 (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	2231.9541	1.2200	2722.9840 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1087.2142	1.2200	1326.4013 (264)
Space and water heating			4049.3853 (265)
Pumps and fans	234.1545	3.0700	718.8544 (267)
Energy for lighting	383.4073	3.0700	1177.0604 (268)
Energy saving/generation technologies			
PV Unit	-598.1811	3.0700	-1836.4159 (269)
Primary energy kWh/year			4108.8842 (272)
Primary energy kWh/m2/year			48.7991 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 5	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	B (H/A - SO)
Project	5 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.62	TER	18.40
Environmental	89 B	% DER<TER	20.52		
CO ₂ Emissions (t/year)	0.92	DFEE	44.30	TTEE	52.35
General Requirements Compliance	Pass	% DFEE<TFEE	15.39		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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 5	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	B (H/A - SO)
Project	5 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.62	TER	18.40
Environmental	89 B	% DER<TER	20.52		
CO ₂ Emissions (t/year)	0.92	DFEE	44.30	TFEE	52.35
General Requirements Compliance	Pass	% DFEE<TFEE	15.39		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.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 5	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	B (H/A - SO)
Project	5 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	87 B	DER	14.62	TER	18.40
Environmental	89 B	% DER<TER	20.52		
CO ₂ Emissions (t/year)	0.92	DFEE	44.30	TFEE	52.35
General Requirements Compliance	Pass	% DFEE<TFEE	15.39		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 42.10 m², Perimeter = 18.47 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 5			Issued on Date	16/02/2022	
Assessment Reference	As Built	Prop Type Ref	B (H/A - SO)			
Property	5 Oram Way, WEST END, SO30 3JW					
SAP Rating		87 B	DER	14.62	TER	18.40
Environmental		89 B	% DER<TER	20.52		
CO ₂ Emissions (t/year)		0.92	DFEE	44.30	TFEE	52.35
General Requirements Compliance		Pass	% DFEE<TFEE	15.39		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com			Assessor ID	E477-0001	
Client	Foreman Homes, FORE					

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

Orientation	South							
Property Tenure	Unknown							
Transaction Type	New dwelling							
Terrain Type	Suburban							
1.0 Property Type	House, Semi-Detached							
2.0 Number of Storeys	2							
3.0 Date Built	2020							
4.0 Sheltered Sides	1							
5.0 Sunlight/Shade	Average or unknown							
6.0 Measurements								
		Heat Loss Perimeter		Internal Floor Area		Average Storey Height		
Ground Floor:		18.47 m		42.10 m ²		2.39 m		
1st Storey:		18.47 m		42.10 m ²		2.67 m		
7.0 Living Area	18.18			m ²				
8.0 Thermal Mass Parameter	Precise calculation			kJ/m ² K				
Thermal Mass	157.92							
9.0 External Walls								
Description		Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Brick and Block		Cavity Wall	Other		0.24	42.22	93.46	79.31
9.1 Party Walls								
Description		Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	
Party Wall 1		Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill		0.00	70.00	44.33	
9.2 Internal Walls								
Description		Construction				Kappa (kJ/m ² K)	Area (m ²)	
GF Stud		Plasterboard on timber frame				9.00	73.31	
First Floor		Plasterboard on timber frame				9.00	83.36	
10.0 External Roofs								
Description		Type	Construction		U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Roof		External Plane Roof	Other		0.10	9.10	42.10	42.10

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	42.10

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	42.10

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.10

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	South							2.12	
Front Elevation	Window	[1] Brick and Block	South	None	0.00					4.65	
Rear Elevation	Window	[1] Brick and Block	North	None	0.00					7.38	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	1.12	0.098	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.01	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	4.80	0.043	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.27	0.060	No	Birtley Supatherm
Independently assessed	E3 Sill	7.69	0.034	No	CD0027
Independently assessed	E4 Jamb	24.60	0.039	No	CD0028
Table K1 - Approved	E5 Ground floor (normal)	18.46	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	18.46	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.69	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.78	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	10.10	0.050	No	CD0035
Table K1 - Default	E25 Staggered party wall between dwellings	10.10	0.120	No	
Table K1 - Default	P1 Party wall - Ground floor	8.77	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.77	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.77	0.049	No	CD0020

Y-value	0.053	W/m²K
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18.0 Pressure Testing

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

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	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500233
Configuration	2
Manufacturer SFP	0.30
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	18	
Total number of L.E.L. fittings	18	
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	17503	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.7	
Controls	87.0	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
	Balanced	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Built)

Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	Gas/Oil, time clock
25.0 Main Heating 2	None

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit		One Dwelling		
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.62	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	£27	B 88	