



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: 6 Oram Way
WEST END, SO30 3JW

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
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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 6	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	(H/A - SO)
Property	6 Oram Way, WEST END, SO30 3JW		
SAP Rating	86 B	DER	14.83
Environmental	89 B	% DER<TER	20.07
CO ₂ Emissions (t/year)	0.93	DFEE	45.78
General Requirements Compliance	Pass	% DFEE<TFEE	16.67
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)	18.55	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.83	kgCO ₂ /m ²	Pass
	-3.72 (-20.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.93	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.78	kWh/m ² /yr	
	-9.1 (-16.6%)	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	4.32 (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

6.71 m², No overhang

Windows facing East

6.94 m², No overhang

Windows facing South

5.40 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

4.32 (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	0.73	kW

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THERMAL BRIDGING

Calculation Type: New Build (As Built)

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SAP Rating	86 B	DER	14.83	TER	18.55
Environmental	89 B	% DER<TER	20.07		
CO ₂ Emissions (t/year)	0.93	DFEE	45.78	TFEE	54.93
General Requirements Compliance	Pass	% DFEE<TFEE	16.67		

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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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.053	1.92	0.10	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	11.44	0.49	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.060	3.57	0.21	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.034	14.42	0.49	CD0027
External wall	E4 Jamb	Independently assessed	0.039	33.00	1.29	CD0028
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	18.80	3.01	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.80	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.83	0.59	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.054	9.06	0.49	CD0031
External wall	E16 Corner (normal)	Independently assessed	0.050	20.20	1.01	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: **10.73** W/mK:
Y-Value: **0.060** W/m²K:

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Semi-Detached House, total floor area 83 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) 18.55 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.83 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 45.8 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:	4.32 (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: 6.71 m², No overhang

Windows facing East: 6.94 m², No overhang

Windows facing South: 5.40 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Door U-value 1.10 W/m²K

Photovoltaic array 0.73 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	41.7300 (1b)	x 2.3900 (2b)	= 99.7347 (1b) - (3b)
First floor	41.7300 (1c)	x 2.6700 (2c)	= 111.4191 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.4600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	211.1538 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																0 * 10 =	0.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) =	0.0000 (8)	
Pressure test															Yes		
Measured/design AP50															4.3200		
Infiltration rate															0.2160 (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) =					0.1998 (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																	
	0.2547	0.2498	0.2448	0.2198	0.2148	0.1898	0.1898	0.1848	0.1998	0.2148	0.2248	0.2348 (22b)					
Mechanical extract ventilation - centralised																	
If mechanical ventilation:															0.5000 (23a)		
Effective ac	0.5047	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)			19.0500	1.1450	21.8130		(27)
Ground Floor			41.7300	0.1200	5.0076	84.0000	3505.3200 (28a)
Brick and Block	95.1300	21.1700	73.9600	0.2400	17.7504	42.2200	3122.5912 (29a)
Pitched Roof	41.7300		41.7300	0.1000	4.1730	9.1000	379.7430 (30)
Total net area of external elements Aum(A, m ²)			178.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	51.0760			(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			77.6600			9.0000	698.9400 (32c)
First Floor			87.3000			9.0000	785.7000 (32c)
Internal Floor 1			41.7300			18.0000	751.1400 (32d)
Internal Ceiling 1			41.7300			18.0000	751.1400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13097.6742 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.9336 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7271 (36)
Total fabric heat loss						(33) + (36) =	61.8031 (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	35.1710	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404 (38)
Heat transfer coeff	96.9741	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435 (39)
Average = Sum(39)m / 12 =												96.6710 (39)
HLP	1.1619	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580 (40)
HLP (average)												1.1583 (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												2.5252 (42)
Average daily hot water use (litres/day)												94.1745 (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 DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	103.5919	99.8249	96.0580	92.2910	88.5240	84.7570	84.7570	88.5240	92.2910	96.0580	99.8249	103.5919 (44)
Energy content (annual)	153.6238	134.3604	138.6479	120.8766	115.9840	100.0853	92.7438	106.4248	107.6959	125.5092	137.0031	148.7765 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1481.7312 (45)
	23.0436	20.1541	20.7972	18.1315	17.3976	15.0128	13.9116	15.9637	16.1544	18.8264	20.5505	22.3165 (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	31.2420	28.2098	31.2031	30.1637	31.1452	30.1129	31.0994	31.1291	30.1405	31.1792	30.2116	31.2328 (61)
Total heat required for water heating calculated for each month	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (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	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (64)
Heat gains from water heating, kWh/month	58.8904	51.7273	53.9012	47.7324	46.3510	40.8066	38.6122	43.1685	43.3440	49.5266	53.1064	57.2764 (65)
								Total per year (kWh/year) =	Sum (64)m =			1848.8004 (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	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1944	17.9365	14.5869	11.0432	8.2550	6.9692	7.5304	9.7884	13.1379	16.6816	19.4699	20.7557 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.5197	228.8702	222.9469	210.3368	194.4188	179.4581	169.4635	167.1129	173.0363	185.6464	201.5644	216.5250 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262 (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)	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096 (71)
Water heating gains (Table 5)	79.1538	76.9751	72.4479	66.2950	62.2997	56.6758	51.8981	58.0222	60.2000	66.5680	73.7589	76.9844 (72)
Total internal gains	389.7465	387.6604	373.8603	351.5536	328.8520	306.9817	292.7706	298.8021	310.2528	332.7746	358.6718	378.1437 (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				6.7100	10.6334		0.6300	0.7000		0.7700	21.8055 (74)	
East				6.9400	19.6403		0.6300	0.7000		0.7700	41.6561 (76)	
South				5.4000	46.7521		0.6300	0.7000		0.7700	77.1554 (78)	
Solar gains	140.6170	249.5203	365.9705	491.3818	582.6541	592.0052	565.1575	495.4059	409.3588	282.5888	170.2956	119.1035 (83)
Total gains	530.3635	637.1807	739.8308	842.9354	911.5062	898.9869	857.9281	794.2080	719.6117	615.3634	528.9674	497.2472 (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	37.5177	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460
alpha	3.5012	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097
util living area	0.9864	0.9738	0.9469	0.8853	0.7728	0.6171	0.4734	0.5251	0.7477	0.9222	0.9766	0.9890 (86)
MIT	19.2573	19.5114	19.8848	20.3267	20.6906	20.8986	20.9697	20.9562	20.7951	20.3036	19.6844	19.1990 (87)
Th 2	19.9506	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538 (88)
util rest of house	0.9835	0.9682	0.9354	0.8601	0.7237	0.5372	0.3700	0.4192	0.6770	0.8995	0.9707	0.9867 (89)
MIT 2	18.3671	18.6204	18.9859	19.4075	19.7342	19.8990	19.9431	19.9370	19.8288	19.3961	18.7941	18.3118 (90)
Living area fraction									fLA = Living area / (4) =			0.1813 (91)
MIT	18.5285	18.7820	19.1489	19.5742	19.9076	20.0802	20.1292	20.1218	20.0040	19.5606	18.9555	18.4726 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5285	18.7820	19.1489	19.5742	19.9076	20.0802	20.1292	20.1218	20.0040	19.5606	18.9555	18.4726 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9781	0.9601	0.9244	0.8494	0.7214	0.5475	0.3880	0.4371	0.6808	0.8890	0.9631	0.9820 (94)
Useful gains	518.7232	611.7740	683.8969	716.0099	657.5187	492.2048	332.8791	347.1264	489.9243	547.0402	509.4736	488.3012 (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	1379.7951	1341.6009	1222.4328	1031.5882	793.2116	529.6234	341.0750	359.6864	570.5818	865.9837	1145.7576	1379.3540 (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	640.6375	490.4437	400.6707	227.2164	100.9555	0.0000	0.0000	0.0000	0.0000	237.2939	458.1245	662.9432 (98)
Space heating												3218.2855 (98)
Space heating per m2												38.5608 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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													3548.2750 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	640.6375	490.4437	400.6707	227.2164	100.9555	0.0000	0.0000	0.0000	0.0000	237.2939	458.1245	662.9432	(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)	706.3258	540.7317	441.7538	250.5142	111.3071	0.0000	0.0000	0.0000	0.0000	261.6251	505.0986	730.9187	(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	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092	(64)
Efficiency of water heater (217)m	89.8443	89.7498	89.5660	89.1855	88.4686	87.0000	87.0000	87.0000	87.0000	89.1914	89.6801	89.8837	(216)
Fuel for water heating, kWh/month	205.7624	181.1371	189.6379	169.3552	166.3065	149.6531	142.3485	158.1080	158.4327	175.6764	186.4567	200.2691	(219)
Water heating fuel used												2083.1437	(219)
Annual totals kWh/year													
Space heating fuel - main system												3548.2750	(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)													108.1952 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													183.1952 (231)
Electricity for lighting (calculated in Appendix L)													356.6393 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 + 0.73 + 853 + 1.00) =										-498.1695			-498.1695 (233)
Total delivered energy for all uses													5673.0838 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year	
Space heating - main system 1	3548.2750	0.2160	766.4274	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2083.1437	0.2160	449.9590	(264)
Space and water heating			1216.3864	(265)
Pumps and fans	183.1952	0.5190	95.0783	(267)
Energy for lighting	356.6393	0.5190	185.0958	(268)
Energy saving/generation technologies				
PV Unit	-498.1695	0.5190	-258.5500	(269)
Total CO ₂ , kg/year			1238.0106	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.8300	(273)

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

DER		14.8300	ZC1
Total Floor Area	TFA	83.4600	
Assumed number of occupants	N	2.5252	
CO ₂ emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO ₂ emissions from appliances, equation (L14)		16.0832	ZC2
CO ₂ emissions from cooking, equation (L16)		2.1520	ZC3
Total CO ₂ emissions		33.0652	ZC4
Residual CO ₂ emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000	ZC6
Resulting CO ₂ emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO ₂ emissions		33.0652	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.7300 (1b)	x 2.3900 (2b)	= 99.7347 (1b) - (3b)
First floor	41.7300 (1c)	x 2.6700 (2c)	= 111.4191 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.4600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.1538 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1421 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3921 (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) =				0.3627 (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	0.4624	0.4533	0.4443	0.3989	0.3899	0.3445	0.3445	0.3355	0.3627	0.3899	0.4080	0.4261 (22b)
Effective ac	0.6069	0.6028	0.5987	0.5796	0.5760	0.5594	0.5594	0.5563	0.5658	0.5760	0.5832	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			18.7500	1.3258	24.8580		(27)
Ground Floor			41.7300	0.1300	5.4249		(28a)
Brick and Block	95.1300	20.8700	74.2600	0.1800	13.3668		(29a)
Pitched Roof	41.7300		41.7300	0.1300	5.4249		(30)
Total net area of external elements Aum(A, m ²)			178.5900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.1946		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.5369 (36)
Total fabric heat loss						(33) + (36) =	62.7315 (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	42.2899	42.0006	41.7171	40.3853	40.1361	38.9761	38.9761	38.7613	39.4229	40.1361	40.6402	41.1672 (38)
Heat transfer coeff	105.0214	104.7321	104.4485	103.1167	102.8676	101.7076	101.7076	101.4928	102.1544	102.8676	103.3716	103.8986 (39)
Average = Sum(39)m / 12 =												103.1155 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2583	1.2549	1.2515	1.2355	1.2325	1.2186	1.2186	1.2161	1.2240	1.2325	1.2386	1.2449 (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												2.5252 (42)
Average daily hot water use (litres/day)												94.1745 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.5919	99.8249	96.0580	92.2910	88.5240	84.7570	84.7570	88.5240	92.2910	96.0580	99.8249	103.5919 (44)
Energy conte	153.6238	134.3604	138.6479	120.8766	115.9840	100.0853	92.7438	106.4248	107.6959	125.5092	137.0031	148.7765 (45)
Energy content (annual)										Total = Sum(45)m =		1481.7312 (45)
Distribution loss (46)m = 0.15 x (45)m	23.0436	20.1541	20.7972	18.1315	17.3976	15.0128	13.9116	15.9637	16.1544	18.8264	20.5505	22.3165 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	45.9468	48.9501	45.5134	45.1109	41.7980	43.1913	45.1109	45.5134	48.9501	49.2287	50.9589 (61)
Solar input	204.5827	180.3072	187.5980	166.3899	161.0948	141.8833	135.9350	151.5357	153.2093	174.4593	186.2318	199.7354 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	204.5827	180.3072	187.5980	166.3899	161.0948	141.8833	135.9350	151.5357	153.2093	174.4593	186.2318	199.7354 (64)
Heat gains from water heating, kWh/month	63.8197	56.1615	58.3379	51.5698	49.8424	43.7279	41.6351	46.6640	47.1872	53.9693	57.8607	62.2079 (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	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1919	17.9343	14.5851	11.0419	8.2539	6.9683	7.5295	9.7872	13.1363	16.6795	19.4675	20.7531	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.5197	228.8702	222.9469	210.3368	194.4188	179.4581	169.4635	167.1129	173.0363	185.6464	201.5644	216.5250	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	(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)	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	(71)
Water heating gains (Table 5)	85.7791	83.5737	78.4112	71.6247	66.9924	60.7332	55.9612	62.7204	65.5378	72.5394	80.3621	83.6128	(72)
Total internal gains	396.3693	394.2569	379.8219	356.8820	333.5438	311.0382	296.8328	303.4991	315.5890	338.7439	365.2726	384.7695	(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			6.6100		10.6334		0.6300		0.7000		0.7700		21.4805 (74)
East			6.8300		19.6403		0.6300		0.7000		0.7700		40.9958 (76)
South			5.3100		46.7521		0.6300		0.7000		0.7700		75.8695 (78)
Solar gains	138.3459	245.5016	360.1054	483.5525	573.4093	582.6282	556.1992	487.5274	402.8138	278.0454	167.5472	117.1784	(83)
Total gains	534.7152	639.7585	739.9273	840.4345	906.9531	893.6664	853.0320	791.0265	718.4028	616.7894	532.8198	501.9480	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.1872	55.3396	55.4898	56.2065	56.3427	56.9853	56.9853	57.1059	56.7360	56.3427	56.0679	55.7835	
alpha	4.6791	4.6893	4.6993	4.7471	4.7562	4.7990	4.7990	4.8071	4.7824	4.7562	4.7379	4.7189	
util living area	0.9973	0.9934	0.9820	0.9442	0.8476	0.6770	0.5131	0.5701	0.8191	0.9678	0.9943	0.9980	(86)
MIT	19.6531	19.8399	20.1295	20.4968	20.7916	20.9489	20.9890	20.9823	20.8707	20.4757	19.9955	19.6233	(87)
Th 2	19.8736	19.8763	19.8790	19.8917	19.8941	19.9051	19.9051	19.9072	19.9009	19.8941	19.8893	19.8843	(88)
util rest of house	0.9964	0.9911	0.9756	0.9239	0.7947	0.5813	0.3913	0.4446	0.7392	0.9520	0.9919	0.9973	(89)
MIT 2	18.0913	18.3651	18.7859	19.3123	19.6957	19.8725	19.9013	19.9002	19.8008	19.2951	18.6022	18.0552	(90)
Living area fraction	18.3744	18.6325	19.0295	19.5271	19.8944	20.0676	20.0985	20.0964	19.9947	19.5092	18.8547	18.3395	(91)
MIT	18.3744	18.6325	19.0295	19.5271	19.8944	20.0676	20.0985	20.0964	19.9947	19.5092	18.8547	18.3395	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3744	18.6325	19.0295	19.5271	19.8944	20.0676	20.0985	20.0964	19.9947	19.5092	18.8547	18.3395	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	531.7760	631.7225	716.9823	769.3936	720.7707	533.0682	352.6812	369.6201	536.6776	582.6227	526.7459	499.8625	(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	1478.1116	1438.2321	1308.6851	1095.8280	842.9369	556.0977	355.8232	375.1581	602.1739	916.4629	1215.1069	1469.0699	(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	704.0737	541.9744	440.2269	235.0328	90.8916	0.0000	0.0000	0.0000	0.0000	248.3771	495.6199	721.0903	(98)
Space heating												3477.2868	(98)
Space heating per m2												41.6641	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3723.0051 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	704.0737	541.9744	440.2269	235.0328	90.8916	0.0000	0.0000	0.0000	0.0000	248.3771	495.6199	721.0903 (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)	753.8262	580.2724	471.3351	251.6411	97.3144	0.0000	0.0000	0.0000	0.0000	265.9284	530.6423	772.0453 (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	204.5827	180.3072	187.5980	166.3899	161.0948	141.8833	135.9350	151.5357	153.2093	174.4593	186.2318	199.7354 (64)
Efficiency of water heater (217)m	87.9105	87.6480	87.1255	85.9205	83.6719	80.3000	80.3000	80.3000	80.3000	85.9401	87.3976	80.3000 (216)
Fuel for water heating, kWh/month	232.7171	205.7175	215.3192	193.6557	192.5315	176.6916	169.2840	188.7120	190.7961	203.0010	213.0858	226.9742 (219)
Water heating fuel used												2408.4854 (219)
Annual totals kWh/year												
Space heating fuel - main system												3723.0051 (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)												356.5954 (232)
Total delivered energy for all uses												6563.0860 (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	3723.0051	0.2160	804.1691 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2408.4854	0.2160	520.2329 (264)
Space and water heating			1324.4020 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	356.5954	0.5190	185.0730 (268)
Total CO2, kg/m2/year			1548.4000 (272)
Emissions per m2 for space and water heating			15.8687 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2175 (272b)
Emissions per m2 for pumps and fans			0.4664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8687 * 1.00) + 2.2175 + 0.4664, rounded to 2 d.p.			18.5500 (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	41.7300 (1b)	x 2.3900 (2b)	= 99.7347 (1b) - (3b)
First floor	41.7300 (1c)	x 2.6700 (2c)	= 111.4191 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.4600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.1538 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1421 (8)
Pressure test					Yes
Measured/design AP50					4.3200
Infiltration rate					0.3581 (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) =				0.3312 (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	0.4223	0.4140	0.4057	0.3643	0.3561	0.3147	0.3147	0.3064	0.3312	0.3561	0.3726	0.3892 (22b)
Effective ac	0.5892	0.5857	0.5823	0.5664	0.5634	0.5495	0.5495	0.5469	0.5549	0.5634	0.5694	0.5757 (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)			19.0500	1.1450	21.8130		(27)
Ground Floor			41.7300	0.1200	5.0076	84.0000	3505.3200 (28a)
Brick and Block	95.1300	21.1700	73.9600	0.2400	17.7504	42.2200	3122.5912 (29a)
Pitched Roof	41.7300		41.7300	0.1000	4.1730	9.1000	379.7430 (30)
Total net area of external elements Aum(A, m ²)			178.5900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.0760		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			77.6600			9.0000	698.9400 (32c)
First Floor			87.3000			9.0000	785.7000 (32c)
Internal Floor 1			41.7300			18.0000	751.1400 (32d)
Internal Ceiling 1			41.7300			9.0000	375.5700 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12722.1042 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 152.4336 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7271 (36)
Total fabric heat loss (33) + (36) = 61.8031 (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	41.0539	40.8126	40.5761	39.4653	39.2575	38.2899	38.2899	38.1108	38.6626	39.2575	39.6779	40.1175 (38)
Heat transfer coeff	102.8570	102.6157	102.3792	101.2684	101.0606	100.0931	100.0931	99.9139	100.4657	101.0606	101.4810	101.9206 (39)
Average = Sum(39)m / 12 =												101.2674 (39)
HLP	1.2324	1.2295	1.2267	1.2134	1.2109	1.1993	1.1993	1.1971	1.2038	1.2109	1.2159	1.2212 (40)
HLP (average)												1.2134 (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												2.5252 (42)
Average daily hot water use (litres/day)												94.1745 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.5919	99.8249	96.0580	92.2910	88.5240	84.7570	84.7570	88.5240	92.2910	96.0580	99.8249	103.5919 (44)
Energy conte	153.6238	134.3604	138.6479	120.8766	115.9840	100.0853	92.7438	106.4248	107.6959	125.5092	137.0031	148.7765 (45)
Energy content (annual)										Total = Sum(45)m =		1481.7312 (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	32.6451	28.5516	29.4627	25.6863	24.6466	21.2681	19.7081	22.6153	22.8854	26.6707	29.1132	31.6150 (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	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1944	17.9365	14.5869	11.0432	8.2550	6.9692	7.5304	9.7884	13.1379	16.6816	19.4699	20.7557	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.5197	228.8702	222.9469	210.3368	194.4188	179.4581	169.4635	167.1129	173.0363	185.6464	201.5644	216.5250	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	(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)	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	(71)
Water heating gains (Table 5)	43.8778	42.4875	39.6004	35.6754	33.1271	29.5391	26.4893	30.3969	31.7852	35.8477	40.4349	42.4933	(72)
Total internal gains	351.4705	350.1728	338.0128	317.9340	296.6795	276.8450	264.3619	268.1768	278.8380	299.0543	322.3478	340.6526	(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					6.7100	10.6334	0.6300	0.7000			0.7700			21.8055 (74)
East					6.9400	19.6403	0.6300	0.7000			0.7700			41.6561 (76)
South					5.4000	46.7521	0.6300	0.7000			0.7700			77.1554 (78)
Solar gains	140.6170	249.5203	365.9705	491.3818	582.6541	592.0052	565.1575	495.4059	409.3588	282.5888	170.2956	119.1035	(83)	
Total gains	492.0875	599.6931	703.9833	809.3158	879.3336	868.8502	829.5194	763.5827	688.1969	581.6431	492.6434	459.7561	(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	34.3576	34.4384	34.5179	34.8966	34.9683	35.3063	35.3063	35.3696	35.1754	34.9683	34.8234	34.6733	
alpha	3.2905	3.2959	3.3012	3.3264	3.3312	3.3538	3.3538	3.3580	3.3450	3.3312	3.3216	3.3116	
util living area	0.9883	0.9771	0.9533	0.8975	0.7940	0.6424	0.4991	0.5530	0.7726	0.9326	0.9800	0.9906	(86)
MIT	19.0387	19.3006	19.7026	20.2014	20.6130	20.8676	20.9576	20.9400	20.7409	20.1854	19.5159	18.9923	(87)
Th 2	19.8942	19.8965	19.8987	19.9093	19.9113	19.9206	19.9206	19.9223	19.9170	19.9113	19.9073	19.9031	(88)
util rest of house	0.9857	0.9722	0.9429	0.8741	0.7464	0.5608	0.3893	0.4418	0.7034	0.9122	0.9749	0.9885	(89)
MIT 2	18.1120	18.3728	18.7695	19.2571	19.6333	19.8478	19.9054	19.8989	19.7560	19.2539	18.5965	18.0725	(90)
Living area fraction	18.2800	18.5410	18.9386	19.4282	19.8109	20.0327	20.0961	20.0876	19.9346	19.4228	18.7632	18.2392	(91)
Temperature adjustment	18.2800	18.5410	18.9386	19.4282	19.8109	20.0327	20.0961	20.0876	19.9346	19.4228	18.7632	18.2392	(92)
adjusted MIT	18.2800	18.5410	18.9386	19.4282	19.8109	20.0327	20.0961	20.0876	19.9346	19.4228	18.7632	18.2392	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9805	0.9641	0.9314	0.8617	0.7414	0.5700	0.4080	0.4600	0.7047	0.9006	0.9675	0.9841	(94)
Ext temp.	482.4907	578.1544	655.7241	697.4192	651.9484	495.2044	338.4793	351.2215	484.9718	523.8270	476.6367	452.4344	(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	1437.9382	1399.7853	1273.4562	1066.1786	819.6958	543.7724	349.9392	368.4415	586.1734	891.6334	1183.5940	1430.8850	(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	710.8529	552.1360	459.5926	265.5068	124.8041	0.0000	0.0000	0.0000	0.0000	273.6480	509.0093	727.9673	(98)
												3623.5169	(98)
												43.4162	(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	940.8747	740.6886	759.3456	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8294	0.8859	0.8595	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	780.3709	656.1511	652.6222	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1109.9456	1062.0012	986.5174	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	237.2938	301.9525	248.4181	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												787.6643 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	59.3234	75.4881	62.1045	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												196.9161 (107)
Space cooling per m2												2.3594 (108)
Energy for space heating												43.4162 (99)
Energy for space cooling												2.3594 (108)
Total												45.7756 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.8 (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	41.7300 (1b)	x 2.3900 (2b)	= 99.7347 (1b) - (3b)
First floor	41.7300 (1c)	x 2.6700 (2c)	= 111.4191 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.4600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.1538 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1421 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3921 (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) =	0.3627 (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	0.4624	0.4533	0.4443	0.3989	0.3899	0.3445	0.3445	0.3355	0.3627	0.3899	0.4080	0.4261 (22b)
Effective ac	0.6069	0.6028	0.5987	0.5796	0.5760	0.5594	0.5594	0.5563	0.5658	0.5760	0.5832	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			18.7500	1.3258	24.8580		(27)
Ground Floor			41.7300	0.1300	5.4249		(28a)
Brick and Block	95.1300	20.8700	74.2600	0.1800	13.3668		(29a)
Pitched Roof	41.7300		41.7300	0.1300	5.4249		(30)
Total net area of external elements Aum(A, m ²)			178.5900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.1946		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.5369 (36)
Total fabric heat loss						(33) + (36) =	62.7315 (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	42.2899	42.0006	41.7171	40.3853	40.1361	38.9761	38.9761	38.7613	39.4229	40.1361	40.6402	41.1672 (38)
Heat transfer coeff	105.0214	104.7321	104.4485	103.1167	102.8676	101.7076	101.7076	101.4928	102.1544	102.8676	103.3716	103.8986 (39)
Average = Sum(39)m / 12 =												103.1155 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2583	1.2549	1.2515	1.2355	1.2325	1.2186	1.2186	1.2161	1.2240	1.2325	1.2386	1.2449 (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												2.5252 (42)
Average daily hot water use (litres/day)												94.1745 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.5919	99.8249	96.0580	92.2910	88.5240	84.7570	84.7570	88.5240	92.2910	96.0580	99.8249	103.5919 (44)
Energy conte	153.6238	134.3604	138.6479	120.8766	115.9840	100.0853	92.7438	106.4248	107.6959	125.5092	137.0031	148.7765 (45)
Energy content (annual)										Total = Sum(45)m =		1481.7312 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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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)
	32.6451	28.5516	29.4627	25.6863	24.6466	21.2681	19.7081	22.6153	22.8854	26.6707	29.1132	31.6150 (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	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	126.2621	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1919	17.9343	14.5851	11.0419	8.2539	6.9683	7.5295	9.7872	13.1363	16.6795	19.4675	20.7531	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.5197	228.8702	222.9469	210.3368	194.4188	179.4581	169.4635	167.1129	173.0363	185.6464	201.5644	216.5250	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	35.6262	(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)	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	(71)
Water heating gains (Table 5)	43.8778	42.4875	39.6004	35.6754	33.1271	29.5391	26.4893	30.3969	31.7852	35.8477	40.4349	42.4933	(72)
Total internal gains	351.4680	350.1706	338.0110	317.9327	296.6785	276.8441	264.3609	268.1756	278.8364	299.0522	322.3454	340.6500	(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					6.6100	10.6334	0.6300	0.7000	0.7700		21.4805 (74)	
East					6.8300	19.6403	0.6300	0.7000	0.7700		40.9958 (76)	
South					5.3100	46.7521	0.6300	0.7000	0.7700		75.8695 (78)	

Solar gains	138.3459	245.5016	360.1054	483.5525	573.4093	582.6282	556.1992	487.5274	402.8138	278.0454	167.5472	117.1784 (83)
Total gains	489.8139	595.6723	698.1164	801.4851	870.0878	859.4723	820.5601	755.7030	681.6502	577.0977	489.8926	457.8285 (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	55.1872	55.3396	55.4898	56.2065	56.3427	56.9853	56.9853	57.1059	56.7360	56.3427	56.0679	55.7835	
alpha	4.6791	4.6893	4.6993	4.7471	4.7562	4.7990	4.7990	4.8071	4.7824	4.7562	4.7379	4.7189	
util living area	0.9982	0.9951	0.9857	0.9525	0.8630	0.6969	0.5314	0.5930	0.8406	0.9748	0.9960	0.9987	(86)
MIT	19.6041	19.7926	20.0870	20.4634	20.7719	20.9422	20.9873	20.9791	20.8536	20.4377	19.9491	19.5750	(87)
Th 2	19.8736	19.8763	19.8790	19.8917	19.8941	19.9051	19.9051	19.9072	19.9009	19.8941	19.8893	19.8843	(88)
util rest of house	0.9975	0.9934	0.9804	0.9345	0.8129	0.6010	0.4063	0.4643	0.7646	0.9620	0.9943	0.9982	(89)
MIT 2	18.6079	18.7978	19.0913	19.4658	19.7437	19.8795	19.9021	19.9015	19.8216	19.4496	18.9646	18.5872	(90)
Living area fraction	18.7885	18.9781	19.2718	19.6466	19.9301	20.0721	20.0988	20.0968	20.0087	19.6287	19.1431	18.7663	(91)
MIT	18.7885	18.9781	19.2718	19.6466	19.9301	20.0721	20.0988	20.0968	20.0087	19.6287	19.1431	18.7663	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7885	18.9781	19.2718	19.6466	19.9301	20.0721	20.0988	20.0968	20.0087	19.6287	19.1431	18.7663	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9966	0.9915	0.9767	0.9296	0.8148	0.6167	0.4292	0.4877	0.7733	0.9579	0.9927	0.9975	(94)
Ext temp.	488.1596	590.5793	681.8404	745.0753	708.9332	530.0524	352.1683	368.5653	527.0882	552.7981	486.2954	456.6951	(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	1521.6041	1474.4324	1333.9968	1108.1558	846.6117	556.5591	355.8539	375.2032	603.5949	928.7642	1244.9140	1513.4151	(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	768.8827	593.9493	485.2044	261.4180	102.4328	0.0000	0.0000	0.0000	0.0000	279.7188	546.2054	786.1997	(98)
Space heating												3824.0110	(98)
Space heating per m2												45.8185	(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	956.0514	752.6362	771.3452	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8798	0.9333	0.9096	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	841.0946	702.4347	701.5844	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1098.9833	1051.5281	977.3057	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	185.6799	259.7255	205.1367	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												650.5421	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.4200	64.9314	51.2842	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												162.6355 (107)
Space cooling per m2												1.9487 (108)
Energy for space heating												45.8185 (99)
Energy for space cooling												1.9487 (108)
Total												47.7672 (109)
Target Fabric Energy Efficiency (TFEE)												54.9 (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	41.7300 (1b)	x 2.3900 (2b)	= 99.7347 (1b) - (3b)
First floor	41.7300 (1c)	x 2.6700 (2c)	= 111.4191 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.4600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.1538 (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					4.3200
Infiltration rate					0.2160 (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)	=	0.1998 (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	0.2348	0.2198	0.2198	0.1998	0.2048	0.1948	0.1948	0.1898	0.1898	0.2048	0.1998	0.2048 (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)			19.0500	1.1450	21.8130		(27)
Ground Floor			41.7300	0.1200	5.0076	84.0000	3505.3200 (28a)
Brick and Block	95.1300	21.1700	73.9600	0.2400	17.7504	42.2200	3122.5912 (29a)
Pitched Roof	41.7300		41.7300	0.1000	4.1730	9.1000	379.7430 (30)
Total net area of external elements Aum(A, m ²)			178.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	51.0760			(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			77.6600			9.0000	698.9400 (32c)
First Floor			87.3000			9.0000	785.7000 (32c)
Internal Floor 1			41.7300			18.0000	751.1400 (32d)
Internal Ceiling 1			41.7300			18.0000	751.1400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13097.6742 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.9336 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7271 (36)
Total fabric heat loss						(33) + (36) =	61.8031 (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	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404 (38)
Average = Sum(39)m / 12 =	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580 (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												2.5252 (42)
Average daily hot water use (litres/day)												94.1745 (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	103.5919	99.8249	96.0580	92.2910	88.5240	84.7570	84.7570	88.5240	92.2910	96.0580	99.8249	103.5919 (44)
Energy content (annual)	153.6238	134.3604	138.6479	120.8766	115.9840	100.0853	92.7438	106.4248	107.6959	125.5092	137.0031	148.7765 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1481.7312 (45)
	23.0436	20.1541	20.7972	18.1315	17.3976	15.0128	13.9116	15.9637	16.1544	18.8264	20.5505	22.3165 (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	31.2420	28.2098	31.2031	30.1637	31.1452	30.1129	31.0994	31.1291	30.1405	31.1792	30.2116	31.2328 (61)
Total heat required for water heating calculated for each month	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (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	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	58.8904	51.7273	53.9012	47.7324	46.3510	40.8066	38.6122	43.1685	43.3440	49.5266	53.1064	57.2764 (65)
												1849 (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	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.4860	44.8412	36.4673	27.6081	20.6374	17.4229	18.8261	24.4709	32.8448	41.7040	48.6747	51.8891 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	338.0891	341.5974	332.7566	313.9355	290.1773	267.8479	252.9306	249.4222	258.2631	277.0841	300.8423	323.1717 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767 (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)	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096 (71)
Water heating gains (Table 5)	79.1538	76.9751	72.4479	66.2950	62.2997	56.6758	51.8981	58.0222	60.2000	66.5680	73.7589	76.9844 (72)
Total internal gains	573.9104	569.5952	547.8533	514.0201	479.2959	448.1282	429.8362	438.0969	457.4894	491.5376	529.4575	558.2267 (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			6.7100		13.4684		0.6300		0.7000		0.7700		27.6192	(74)
East			6.9400		25.1733		0.6300		0.7000		0.7700		53.3913	(76)
South			5.4000		56.5862		0.6300		0.7000		0.7700		93.3848	(78)

Solar gains	174.3953	264.0200	395.9426	536.3714	600.3615	675.6731	619.4801	565.3011	464.5713	323.1314	210.6446	139.7537	(83)	
Total gains	748.3057	833.6152	943.7958	1050.3915	1079.6573	1123.8013	1049.3163	1003.3980	922.0607	814.6690	740.1021	697.9805	(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	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460
alpha	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097
util living area	0.9534	0.9336	0.8824	0.7794	0.6295	0.4246	0.3007	0.3048	0.5459	0.7989	0.9205	0.9608 (86)
MIT	19.7670	19.9316	20.2645	20.6264	20.8666	20.9750	20.9946	20.9945	20.9397	20.6670	20.1771	19.7142 (87)
Th 2	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538 (88)
util rest of house	0.9437	0.9203	0.8595	0.7387	0.5655	0.3429	0.2069	0.2068	0.4580	0.7500	0.9016	0.9524 (89)
MIT 2	18.8701	19.0287	19.3448	19.6730	19.8713	19.9436	19.9527	19.9527	19.9255	19.7182	19.2696	18.8196 (90)
Living area fraction									fLA = Living area / (4) =			0.1813 (91)
MIT	19.0327	19.1924	19.5116	19.8459	20.0518	20.1306	20.1416	20.1416	20.1093	19.8902	19.4341	18.9817 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0327	19.1924	19.5116	19.8459	20.0518	20.1306	20.1416	20.1416	20.1093	19.8902	19.4341	18.9817 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9332	0.9086	0.8484	0.7340	0.5719	0.3571	0.2239	0.2246	0.4717	0.7466	0.8903	0.9425 (94)
Useful gains	698.2923	757.4543	800.6969	771.0377	617.4207	401.2998	234.9871	225.3566	434.9516	608.2363	658.9169	657.8780 (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	1298.1844	1274.9564	1151.1748	941.8755	671.8431	408.8603	235.9603	226.2988	455.1269	752.8701	1047.0448	1283.5942 (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	446.3197	347.7614	260.7556	123.0032	40.4902	0.0000	0.0000	0.0000	0.0000	107.6076	279.4521	465.5329 (98)
Space heating												2070.9227 (98)
RHI space heating demand												2071 (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	41.7300 (1b)	x 2.3900 (2b)	= 99.7347 (1b) - (3b)
First floor	41.7300 (1c)	x 2.6700 (2c)	= 111.4191 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.4600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.1538 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																0 * 10 =	0.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =	0.0000 (8)		
Pressure test														Yes			
Measured/design AP50														4.3200			
Infiltration rate														0.2160 (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) =				0.1998 (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																	
	0.2547	0.2498	0.2448	0.2198	0.2148	0.1898	0.1898	0.1848	0.1998	0.2148	0.2248	0.2348 (22b)					
Mechanical extract ventilation - centralised																	
If mechanical ventilation:														0.5000 (23a)			
Effective ac	0.5047	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)			19.0500	1.1450	21.8130		(27)
Ground Floor			41.7300	0.1200	5.0076	84.0000	3505.3200 (28a)
Brick and Block	95.1300	21.1700	73.9600	0.2400	17.7504	42.2200	3122.5912 (29a)
Pitched Roof	41.7300		41.7300	0.1000	4.1730	9.1000	379.7430 (30)
Total net area of external elements Aum(A, m ²)			178.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	51.0760			(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			77.6600			9.0000	698.9400 (32c)
First Floor			87.3000			9.0000	785.7000 (32c)
Internal Floor 1			41.7300			18.0000	751.1400 (32d)
Internal Ceiling 1			41.7300			18.0000	751.1400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13097.6742 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.9336 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7271 (36)
Total fabric heat loss						(33) + (36) =	61.8031 (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	35.1710	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404 (38)
Heat transfer coeff	96.9741	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435 (39)
Average = Sum(39)m / 12 =												96.6710 (39)
HLP	1.1619	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580 (40)
HLP (average)												1.1583 (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												2.5252 (42)
Average daily hot water use (litres/day)												94.1745 (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	103.5919	99.8249	96.0580	92.2910	88.5240	84.7570	84.7570	88.5240	92.2910	96.0580	99.8249	103.5919 (44)
Energy content (annual)	153.6238	134.3604	138.6479	120.8766	115.9840	100.0853	92.7438	106.4248	107.6959	125.5092	137.0031	148.7765 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1481.7312 (45)
	23.0436	20.1541	20.7972	18.1315	17.3976	15.0128	13.9116	15.9637	16.1544	18.8264	20.5505	22.3165 (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	31.2420	28.2098	31.2031	30.1637	31.1452	30.1129	31.0994	31.1291	30.1405	31.1792	30.2116	31.2328 (61)
Total heat required for water heating calculated for each month	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (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	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (64)
Heat gains from water heating, kWh/month	58.8904	51.7273	53.9012	47.7324	46.3510	40.8066	38.6122	43.1685	43.3440	49.5266	53.1064	57.2764 (65)
								Total per year (kWh/year) = Sum (64)m =				1848.8004 (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	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.4860	44.8412	36.4673	27.6081	20.6374	17.4229	18.8261	24.4709	32.8448	41.7040	48.6747	51.8891 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	338.0891	341.5974	332.7566	313.9355	290.1773	267.8479	252.9306	249.4222	258.2631	277.0841	300.8423	323.1717 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767 (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)	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096 (71)
Water heating gains (Table 5)	79.1538	76.9751	72.4479	66.2950	62.2997	56.6758	51.8981	58.0222	60.2000	66.5680	73.7589	76.9844 (72)
Total internal gains	573.9104	569.5952	547.8533	514.0201	479.2959	448.1282	429.8362	438.0969	457.4894	491.5376	529.4575	558.2267 (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	6.7100				10.6334		0.6300		0.7000		0.7700		21.8055 (74)	
East	6.9400				19.6403		0.6300		0.7000		0.7700		41.6561 (76)	
South	5.4000				46.7521		0.6300		0.7000		0.7700		77.1554 (78)	
Solar gains	140.6170	249.5203	365.9705	491.3818	582.6541	592.0052	565.1575	495.4059	409.3588	282.5888	170.2956	119.1035	(83)	
Total gains	714.5274	819.1155	913.8237	1005.4019	1061.9500	1040.1334	994.9938	933.5028	866.8482	774.1265	699.7531	677.3302	(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	37.5177	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460
alpha	3.5012	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097
util living area	0.9673	0.9473	0.9092	0.8330	0.7094	0.5516	0.4147	0.4571	0.6674	0.8672	0.9487	0.9724 (86)
MIT	19.5244	19.7587	20.0922	20.4719	20.7686	20.9288	20.9800	20.9716	20.8594	20.4688	19.9188	19.4644 (87)
Th 2	19.9506	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538 (88)
util rest of house	0.9608	0.9371	0.8917	0.8012	0.6567	0.4749	0.3214	0.3609	0.5933	0.8343	0.9370	0.9668 (89)
MIT 2	18.6293	18.8602	19.1815	19.5357	19.7942	19.9165	19.9469	19.9433	19.8719	19.5430	19.0204	18.5731 (90)
Living area fraction	18.7916	19.0231	19.3466	19.7054	19.9708	20.1000	20.1342	20.1297	20.0509	19.7109	19.1833	18.7347 (92)
MIT	18.7916	19.0231	19.3466	19.7054	19.9708	20.1000	20.1342	20.1297	20.0509	19.7109	19.1833	18.7347 (93)
Temperature adjustment												0.0000
adjusted MIT	18.7916	19.0231	19.3466	19.7054	19.9708	20.1000	20.1342	20.1297	20.0509	19.7109	19.1833	18.7347 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	679.9895	758.4821	803.9716	797.0617	698.3481	505.6521	336.2551	352.5029	520.7075	638.9994	648.1514	649.1685 (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	1405.3078	1364.9011	1241.5391	1044.2756	799.3196	531.5406	341.5590	360.4546	575.1176	880.5071	1167.7690	1404.6820 (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	539.6368	407.5136	325.5502	177.9940	75.1228	0.0000	0.0000	0.0000	0.0000	179.6817	374.1247	562.1021 (98)
Space heating												2641.7259 (98)
Space heating per m ²												31.6526 (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	2912.5974	(211)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	539.6368	407.5136	325.5502	177.9940	75.1228	0.0000	0.0000	0.0000	0.0000	179.6817	374.1247	562.1021	(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)	594.9689	449.2983	358.9308	196.2448	82.8256	0.0000	0.0000	0.0000	0.0000	198.1055	412.4859	619.7377	(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	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092	(64)
Efficiency of water heater	89.7263	89.6132	89.3965	88.9632	88.2164	87.0000	87.0000	87.0000	87.0000	88.9381	89.5239	87.0000	(216)
(217)m	89.7263	89.6132	89.3965	88.9632	88.2164	87.0000	87.0000	87.0000	87.0000	88.9381	89.5239	89.7739	(217)
Fuel for water heating, kWh/month	206.0330	181.4132	189.9974	169.7783	166.7821	149.6531	142.3485	158.1080	158.4327	176.1769	186.7820	200.5140	(219)
Water heating fuel used	206.0330	181.4132	189.9974	169.7783	166.7821	149.6531	142.3485	158.1080	158.4327	176.1769	186.7820	2086.0192	(219)
Annual totals kWh/year													
Space heating fuel - main system												2912.5974	(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)												108.1952	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												183.1952	(231)
Electricity for lighting (calculated in Appendix L)												356.6393	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.73 * 853 + 1.00) =										-498.1695		-498.1695	(233)
Total delivered energy for all uses												5040.2817	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2912.5974	3.4800	101.3584 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2086.0192	3.4800	72.5935 (247)
Mechanical ventilation fans	108.1952	13.1900	14.2709 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	356.6393	13.1900	47.0407 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-498.1695	13.1900	-65.7086 (252)
Total energy cost			299.4475 (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] =	0.9790 (257)
SAP value	86.3423	
SAP rating (Section 12)	86	(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	2912.5974	0.2160	629.1210 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2086.0192	0.2160	450.5802 (264)
Space and water heating			1079.7012 (265)
Pumps and fans	183.1952	0.5190	95.0783 (267)
Energy for lighting	356.6393	0.5190	185.0958 (268)
Energy saving/generation technologies			
PV Unit	-498.1695	0.5190	-258.5500 (269)
Total kg/year			1101.3254 (272)
CO2 emissions per m2			13.2000 (273)
EI value			88.5118
EI rating			89 (274)
EI band			B

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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	$3.48 / 0.8851 = 3.932$, stars = 4
Water heating environmental impact	$0.216 / 0.8851 = 0.2440$, 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	41.7300 (1b)	x 2.3900 (2b)	= 99.7347 (1b) - (3b)
First floor	41.7300 (1c)	x 2.6700 (2c)	= 111.4191 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.4600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.1538 (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					4.3200
Infiltration rate					0.2160 (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)	=	0.1998 (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	0.2348	0.2198	0.2198	0.1998	0.2048	0.1948	0.1948	0.1898	0.1898	0.2048	0.1998	0.2048 (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)			19.0500	1.1450	21.8130		(27)
Ground Floor			41.7300	0.1200	5.0076	84.0000	3505.3200 (28a)
Brick and Block	95.1300	21.1700	73.9600	0.2400	17.7504	42.2200	3122.5912 (29a)
Pitched Roof	41.7300		41.7300	0.1000	4.1730	9.1000	379.7430 (30)
Total net area of external elements Aum(A, m ²)			178.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	51.0760			(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			77.6600			9.0000	698.9400 (32c)
First Floor			87.3000			9.0000	785.7000 (32c)
Internal Floor 1			41.7300			18.0000	751.1400 (32d)
Internal Ceiling 1			41.7300			18.0000	751.1400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13097.6742 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.9336 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7271 (36)
Total fabric heat loss						(33) + (36) =	61.8031 (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	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404 (38)
Average = Sum(39)m / 12 =	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580 (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												2.5252 (42)
Average daily hot water use (litres/day)												94.1745 (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	103.5919	99.8249	96.0580	92.2910	88.5240	84.7570	84.7570	88.5240	92.2910	96.0580	99.8249	103.5919 (44)
Energy content (annual)	153.6238	134.3604	138.6479	120.8766	115.9840	100.0853	92.7438	106.4248	107.6959	125.5092	137.0031	148.7765 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1481.7312 (45)
	23.0436	20.1541	20.7972	18.1315	17.3976	15.0128	13.9116	15.9637	16.1544	18.8264	20.5505	22.3165 (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	31.2420	28.2098	31.2031	30.1637	31.1452	30.1129	31.0994	31.1291	30.1405	31.1792	30.2116	31.2328 (61)
Total heat required for water heating calculated for each month	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (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	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (64)
Heat gains from water heating, kWh/month	58.8904	51.7273	53.9012	47.7324	46.3510	40.8066	38.6122	43.1685	43.3440	49.5266	53.1064	57.2764 (65)
										Total per year (kWh/year) = Sum (64)m =		1848.8004 (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	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	50.4860	44.8412	36.4673	27.6081	20.6374	17.4229	18.8261	24.4709	32.8448	41.7040	48.6747	51.8891 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	338.0891	341.5974	332.7566	313.9355	290.1773	267.8479	252.9306	249.4222	258.2631	277.0841	300.8423	323.1717 (68)
Pumps, fans	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767 (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)	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096 (71)
Total internal gains	79.1538	76.9751	72.4479	66.2950	62.2997	56.6758	51.8981	58.0222	60.2000	66.5680	73.7589	76.9844 (72)
	573.9104	569.5952	547.8533	514.0201	479.2959	448.1282	429.8362	438.0969	457.4894	491.5376	529.4575	558.2267 (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			6.7100		13.4684		0.6300		0.7000		0.7700		27.6192	(74)
East			6.9400		25.1733		0.6300		0.7000		0.7700		53.3913	(76)
South			5.4000		56.5862		0.6300		0.7000		0.7700		93.3848	(78)
Solar gains	174.3953	264.0200	395.9426	536.3714	600.3615	675.6731	619.4801	565.3011	464.5713	323.1314	210.6446	139.7537	(83)	
Total gains	748.3057	833.6152	943.7958	1050.3915	1079.6573	1123.8013	1049.3163	1003.3980	922.0607	814.6690	740.1021	697.9805	(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	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460
util living area	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097
	0.9534	0.9336	0.8824	0.7794	0.6295	0.4246	0.3007	0.3048	0.5459	0.7989	0.9205	0.9608 (86)
MIT	19.7670	19.9316	20.2645	20.6264	20.8666	20.9750	20.9946	20.9945	20.9397	20.6670	20.1771	19.7142 (87)
Th 2	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538 (88)
util rest of house	0.9437	0.9203	0.8595	0.7387	0.5655	0.3429	0.2069	0.2068	0.4580	0.7500	0.9016	0.9524 (89)
MIT 2	18.8701	19.0287	19.3448	19.6730	19.8713	19.9436	19.9527	19.9527	19.9255	19.7182	19.2696	18.8196 (90)
Living area fraction	19.0327	19.1924	19.5116	19.8459	20.0518	20.1306	20.1416	20.1416	fLA = Living area / (4) =	19.8902	19.4341	0.1813 (91)
MIT	19.0327	19.1924	19.5116	19.8459	20.0518	20.1306	20.1416	20.1416	20.1093	19.8902	19.4341	18.9817 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0327	19.1924	19.5116	19.8459	20.0518	20.1306	20.1416	20.1416	20.1093	19.8902	19.4341	18.9817 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9332	0.9086	0.8484	0.7340	0.5719	0.3571	0.2239	0.2246	0.4717	0.7466	0.8903	0.9425 (94)
Ext temp.	698.2923	757.4543	800.6969	771.0377	617.4207	401.2998	234.9871	225.3566	434.9516	608.2363	658.9169	657.8780 (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	1298.1844	1274.9564	1151.1748	941.8755	671.8431	408.8603	235.9603	226.2988	455.1269	752.8701	1047.0448	1283.5942 (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	446.3197	347.7614	260.7556	123.0032	40.4902	0.0000	0.0000	0.0000	0.0000	107.6076	279.4521	465.5329 (98)
Space heating per m2												2070.9227 (98)
										(98) / (4) =		24.8134 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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												2283.2665 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	446.3197	347.7614	260.7556	123.0032	40.4902	0.0000	0.0000	0.0000	0.0000	107.6076	279.4521	465.5329 (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)	492.0835	383.4195	287.4924	135.6154	44.6419	0.0000	0.0000	0.0000	0.0000	118.6412	308.1059	513.2667 (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	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (64)
Efficiency of water heater	89.5841	89.4876	89.2036	88.6227	87.7727	87.0000	87.0000	87.0000	87.0000	88.4694	89.2786	87.0000 (216)
(217)m												89.6370 (217)
Fuel for water heating, kWh/month	206.3600	181.6677	190.4083	170.4307	167.6251	149.6531	142.3485	158.1080	158.4327	177.1102	187.2953	200.8203 (219)
Water heating fuel used												2090.2599 (219)
Annual totals kWh/year												
Space heating fuel - main system												2283.2665 (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)												108.1952 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												183.1952 (231)
Electricity for lighting (calculated in Appendix L)												356.6393 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.73 * 966 * 1.00) =										-564.0201		-564.0201 (233)
Total delivered energy for all uses												4349.3409 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2283.2665	3.6300	82.8826 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2090.2599	3.6300	75.8764 (247)
Mechanical ventilation fans	108.1952	19.4400	21.0331 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	356.6393	19.4400	69.3307 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-564.0201	19.4400	-109.6455 (252)
Total energy cost			249.0573 (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	2283.2665	0.2160	493.1856 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2090.2599	0.2160	451.4961 (264)
Space and water heating			944.6817 (265)
Pumps and fans	183.1952	0.5190	95.0783 (267)
Energy for lighting	356.6393	0.5190	185.0958 (268)
Energy saving/generation technologies			
PV Unit	-564.0201	0.5190	-292.7264 (269)
Total kg/year			932.1294 (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	2283.2665	1.2200	2785.5851 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2090.2599	1.2200	2550.1171 (264)
Space and water heating			5335.7022 (265)
Pumps and fans	183.1952	3.0700	562.4093 (267)
Energy for lighting	356.6393	3.0700	1094.8827 (268)

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Energy saving/generation technologies			
PV Unit	-564.0201	3.0700	-1731.5416 (269)
Primary energy kWh/year			5261.4526 (272)
Primary energy kWh/m2/year			63.0416 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 86
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 (20.5%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£27 2.30 kg/m²	B 88	B 90
Total Savings	£27 2.30 kg/m²		

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	B 90

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	£105	£115	-£10
Mains gas	£254	£217	£37
Space heating	£213	£213	£0
Water heating	£76	£49	£27
Lighting	£69	£69	£0
Generated (PV)	-£110	-£110	£0
Total cost of fuels	£249	£222	£27
Total cost of uses	£248	£221	£27
Delivered energy	52 kWh/m²	41 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	63 kWh/m²	50 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	41.7300 (1b)	x 2.3900 (2b)	= 99.7347 (1b) - (3b)
First floor	41.7300 (1c)	x 2.6700 (2c)	= 111.4191 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.4600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.1538 (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												4.3200
Infiltration rate												0.2160 (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) =	0.1998 (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												
	0.2547	0.2498	0.2448	0.2198	0.2148	0.1898	0.1898	0.1848	0.1998	0.2148	0.2248	0.2348 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5047	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)			19.0500	1.1450	21.8130		(27)
Ground Floor			41.7300	0.1200	5.0076	84.0000	3505.3200 (28a)
Brick and Block	95.1300	21.1700	73.9600	0.2400	17.7504	42.2200	3122.5912 (29a)
Pitched Roof	41.7300		41.7300	0.1000	4.1730	9.1000	379.7430 (30)
Total net area of external elements Aum(A, m ²)			178.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	51.0760			(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			77.6600			9.0000	698.9400 (32c)
First Floor			87.3000			9.0000	785.7000 (32c)
Internal Floor 1			41.7300			18.0000	751.1400 (32d)
Internal Ceiling 1			41.7300			18.0000	751.1400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13097.6742 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.9336 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7271 (36)
Total fabric heat loss						(33) + (36) =	61.8031 (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	35.1710	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404 (38)
Heat transfer coeff	96.9741	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435 (39)
Average = Sum(39)m / 12 =												96.6710 (39)
HLP	1.1619	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580 (40)
HLP (average)												1.1583 (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												2.5252 (42)
Average daily hot water use (litres/day)												94.1745 (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 FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	103.5919	99.8249	96.0580	92.2910	88.5240	84.7570	84.7570	88.5240	92.2910	96.0580	99.8249	103.5919 (44)
Energy content (annual)	153.6238	134.3604	138.6479	120.8766	115.9840	100.0853	92.7438	106.4248	107.6959	125.5092	137.0031	148.7765 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1481.7312 (45)
	23.0436	20.1541	20.7972	18.1315	17.3976	15.0128	13.9116	15.9637	16.1544	18.8264	20.5505	22.3165 (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	31.2420	28.2098	31.2031	30.1637	31.1452	30.1129	31.0994	31.1291	30.1405	31.1792	30.2116	31.2328 (61)
Total heat required for water heating calculated for each month	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (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												1.2240 (H8)
Utilisation factor												0.5582 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.1745 (H14)
Volume ratio Veff/V												0.7964 (H15)
Solar storage volume factor												0.9545 (H16)
Solar input												-849.6996 (H17)
Solar input	-24.6396	-41.1164	-70.0259	-93.8486	-115.9420	-113.9894	-112.4830	-98.2770	-76.9706	-52.5619	-29.2261	-20.6191 (63)
												-849.6996 (63)
Solar input (sum of months) = Sum (63)m =												
Output from w/h	160.2262	121.4537	99.8251	57.1917	31.1871	16.2088	11.3602	39.2770	60.8659	104.1265	137.9885	159.3901 (64)
												999.1008 (64)
Total per year (kWh/year) = Sum (64)m =												
Heat gains from water heating, kWh/month	58.8904	51.7273	53.9012	47.7324	46.3510	40.8066	38.6122	43.1685	43.3440	49.5266	53.1064	57.2764 (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	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.4860	44.8412	36.4673	27.6081	20.6374	17.4229	18.8261	24.4709	32.8448	41.7040	48.6747	51.8891 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	338.0891	341.5974	332.7566	313.9355	290.1773	267.8479	252.9306	249.4222	258.2631	277.0841	300.8423	323.1717 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767 (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)	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096 (71)
Water heating gains (Table 5)	79.1538	76.9751	72.4479	66.2950	62.2997	56.6758	51.8981	58.0222	60.2000	66.5680	73.7589	76.9844 (72)
Total internal gains	573.9104	569.5952	547.8533	514.0201	479.2959	448.1282	429.8362	438.0969	457.4894	491.5376	529.4575	558.2267 (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	6.7100	10.6334	0.6300	0.7000	0.7700	21.8055 (74)
East	6.9400	19.6403	0.6300	0.7000	0.7700	41.6561 (76)
South	5.4000	46.7521	0.6300	0.7000	0.7700	77.1554 (78)

Solar gains	140.6170	249.5203	365.9705	491.3818	582.6541	592.0052	565.1575	495.4059	409.3588	282.5888	170.2956	119.1035 (83)
Total gains	714.5274	819.1155	913.8237	1005.4019	1061.9500	1040.1334	994.9938	933.5028	866.8482	774.1265	699.7531	677.3302 (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	37.5177	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	
alpha	3.5012	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	
util living area	0.9673	0.9473	0.9092	0.8330	0.7094	0.5516	0.4147	0.4571	0.6674	0.8672	0.9487	0.9724 (86)
MIT	19.5244	19.7587	20.0922	20.4719	20.7686	20.9288	20.9800	20.9716	20.8594	20.4688	19.9188	19.4644 (87)
Th 2	19.9506	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538 (88)
util rest of house	0.9608	0.9371	0.8917	0.8012	0.6567	0.4749	0.3214	0.3609	0.5933	0.8343	0.9370	0.9668 (89)
MIT 2	18.6293	18.8602	19.1815	19.5357	19.7942	19.9165	19.9469	19.9433	19.8719	19.5430	19.0204	18.5731 (90)
Living area fraction									fLA = Living area / (4) =			0.1813 (91)
MIT	18.7916	19.0231	19.3466	19.7054	19.9708	20.1000	20.1342	20.1297	20.0509	19.7109	19.1833	18.7347 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7916	19.0231	19.3466	19.7054	19.9708	20.1000	20.1342	20.1297	20.0509	19.7109	19.1833	18.7347 (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	0.9517	0.9260	0.8798	0.7928	0.6576	0.4861	0.3379	0.3776	0.6007	0.8254	0.9263	0.9584	(94)
Useful gains	679.9895	758.4821	803.9716	797.0617	698.3481	505.6521	336.2551	352.5029	520.7075	638.9994	648.1514	649.1685	(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	1405.3078	1364.9011	1241.5391	1044.2756	799.3196	531.5406	341.5590	360.4546	575.1176	880.5071	1167.7690	1404.6820	(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	539.6368	407.5136	325.5502	177.9940	75.1228	0.0000	0.0000	0.0000	0.0000	179.6817	374.1247	562.1021	(98)
Space heating												2641.7259	(98)
Space heating per m2											(98) / (4) =	31.6526	(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													2912.5974	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	539.6368	407.5136	325.5502	177.9940	75.1228	0.0000	0.0000	0.0000	0.0000	179.6817	374.1247	562.1021	(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)	594.9689	449.2983	358.9308	196.2448	82.8256	0.0000	0.0000	0.0000	0.0000	198.1055	412.4859	619.7377	(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	160.2262	121.4537	99.8251	57.1917	31.1871	16.2088	11.3602	39.2770	60.8659	104.1265	137.9885	159.3901	(64)	
Efficiency of water heater	89.8254	89.8229	89.8037	89.7716	89.5823	87.0000	87.0000	87.0000	87.0000	89.3065	89.6724	89.8558	(216)	
(217)m	89.8254	89.8229	89.8037	89.7716	89.5823	87.0000	87.0000	87.0000	87.0000	89.3065	89.6724	89.8558	(217)	
Fuel for water heating, kWh/month	178.3751	135.2147	111.1592	63.7080	34.8139	18.6308	13.0577	45.1459	69.9608	116.5945	153.8807	177.3844	(219)	
Water heating fuel used												1117.9257	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2912.5974	(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)													108.1952	(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													233.1952	(231)
Electricity for lighting (calculated in Appendix L)													356.6393	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 853 * 1.00) =										-498.1695			-498.1695	(233)
Total delivered energy for all uses													4122.1881	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2912.5974	3.4800	101.3584	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1117.9257	3.4800	38.9038	(247)
Mechanical ventilation fans	108.1952	13.1900	14.2709	(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	356.6393	13.1900	47.0407	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-498.1695	13.1900	-65.7086	(252)
Total energy cost			272.3528	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		0.8905	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	87.5781	
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	2912.5974	0.2160	629.1210 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1117.9257	0.2160	241.4719 (264)
Space and water heating			870.5930 (265)
Pumps and fans	233.1952	0.5190	121.0283 (267)
Energy for lighting	356.6393	0.5190	185.0958 (268)
Energy saving/generation technologies			
PV Unit	-498.1695	0.5190	-258.5500 (269)
Total kg/year			918.1671 (272)
CO2 emissions per m2			11.0000 (273)
EI value			90.4224
EI rating			90 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.7300 (1b)	x 2.3900 (2b)	= 99.7347 (1b) - (3b)
First floor	41.7300 (1c)	x 2.6700 (2c)	= 111.4191 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.4600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	211.1538 (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												4.3200
Infiltration rate												0.2160 (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) =	0.1998 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
	0.2348	0.2198	0.2198	0.1998	0.2048	0.1948	0.1948	0.1898	0.1898	0.2048	0.1998	0.2048 (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)			19.0500	1.1450	21.8130		(27)
Ground Floor			41.7300	0.1200	5.0076	84.0000	3505.3200 (28a)
Brick and Block	95.1300	21.1700	73.9600	0.2400	17.7504	42.2200	3122.5912 (29a)
Pitched Roof	41.7300		41.7300	0.1000	4.1730	9.1000	379.7430 (30)
Total net area of external elements Aum(A, m ²)			178.5900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.0760		(33)
Party Wall 1			44.3300	0.0000	0.0000	70.0000	3103.1000 (32)
GF Stud			77.6600			9.0000	698.9400 (32c)
First Floor			87.3000			9.0000	785.7000 (32c)
Internal Floor 1			41.7300			18.0000	751.1400 (32d)
Internal Ceiling 1			41.7300			18.0000	751.1400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13097.6742 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.9336 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7271 (36)
Total fabric heat loss						(33) + (36) =	61.8031 (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	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404	34.8404 (38)
Heat transfer coeff	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435	96.6435 (39)
Average = Sum(39)m / 12 =												96.6435 (39)
HLP	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580	1.1580 (40)
HLP (average)												1.1580 (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												2.5252 (42)
Average daily hot water use (litres/day)												94.1745 (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 EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	103.5919	99.8249	96.0580	92.2910	88.5240	84.7570	84.7570	88.5240	92.2910	96.0580	99.8249	103.5919 (44)
Energy content (annual)	153.6238	134.3604	138.6479	120.8766	115.9840	100.0853	92.7438	106.4248	107.6959	125.5092	137.0031	148.7765 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =		1481.7312 (45)
	23.0436	20.1541	20.7972	18.1315	17.3976	15.0128	13.9116	15.9637	16.1544	18.8264	20.5505	22.3165 (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	31.2420	28.2098	31.2031	30.1637	31.1452	30.1129	31.0994	31.1291	30.1405	31.1792	30.2116	31.2328 (61)
Total heat required for water heating calculated for each month	184.8658	162.5701	169.8510	151.0402	147.1291	130.1982	123.8432	137.5539	137.8364	156.6883	167.2146	180.0092 (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												1.3674 (H8)
Utilisation factor												0.5187 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.1745 (H14)
Volume ratio Veff/V												0.7964 (H15)
Solar storage volume factor												0.9545 (H16)
Solar input												-882.0540 (H17)
Solar input	-28.7825	-40.9320	-71.0276	-95.5441	-111.0287	-120.7670	-114.5055	-104.4179	-81.7277	-56.4872	-34.0432	-22.7905 (63)
								Solar input (sum of months) =	Sum (63)m =			-882.0540 (63)
Output from w/h	156.0833	121.6381	98.8234	55.4962	36.1005	9.4312	9.3377	33.1360	56.1088	100.2011	133.1714	157.2188 (64)
								Total per year (kWh/year) =	Sum (64)m =			966.7464 (64)
Heat gains from water heating, kWh/month	58.8904	51.7273	53.9012	47.7324	46.3510	40.8066	38.6122	43.1685	43.3440	49.5266	53.1064	57.2764 (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	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	151.5145	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.4860	44.8412	36.4673	27.6081	20.6374	17.4229	18.8261	24.4709	32.8448	41.7040	48.6747	51.8891	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	338.0891	341.5974	332.7566	313.9355	290.1773	267.8479	252.9306	249.4222	258.2631	277.0841	300.8423	323.1717	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	52.6767	(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)	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	-101.0096	(71)
Water heating gains (Table 5)	79.1538	76.9751	72.4479	66.2950	62.2997	56.6758	51.8981	58.0222	60.2000	66.5680	73.7589	76.9844	(72)
Total internal gains	573.9104	569.5952	547.8533	514.0201	479.2959	448.1282	429.8362	438.0969	457.4894	491.5376	529.4575	558.2267	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF Access factor Table 6d	Gains W	
North	6.7100	13.4684	0.6300	0.7000	0.7700	27.6192	(74)
East	6.9400	25.1733	0.6300	0.7000	0.7700	53.3913	(76)
South	5.4000	56.5862	0.6300	0.7000	0.7700	93.3848	(78)

Solar gains	174.3953	264.0200	395.9426	536.3714	600.3615	675.6731	619.4801	565.3011	464.5713	323.1314	210.6446	139.7537	(83)
Total gains	748.3057	833.6152	943.7958	1050.3915	1079.6573	1123.8013	1049.3163	1003.3980	922.0607	814.6690	740.1021	697.9805	(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	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	37.6460	
alpha	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	3.5097	
util living area	0.9534	0.9336	0.8824	0.7794	0.6295	0.4246	0.3007	0.3048	0.5459	0.7989	0.9205	0.9608	(86)
MIT	19.7670	19.9316	20.2645	20.6264	20.8666	20.9750	20.9946	20.9945	20.9397	20.6670	20.1771	19.7142	(87)
Th 2	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	19.9538	(88)
util rest of house	0.9437	0.9203	0.8595	0.7387	0.5655	0.3429	0.2069	0.2068	0.4580	0.7500	0.9016	0.9524	(89)
MIT 2	18.8701	19.0287	19.3448	19.6730	19.8713	19.9436	19.9527	19.9527	19.9255	19.7182	19.2696	18.8196	(90)
Living area fraction									fLA = Living area / (4) =				0.1813 (91)
MIT	19.0327	19.1924	19.5116	19.8459	20.0518	20.1306	20.1416	20.1416	20.1093	19.8902	19.4341	18.9817	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0327	19.1924	19.5116	19.8459	20.0518	20.1306	20.1416	20.1416	20.1093	19.8902	19.4341	18.9817	(93)

FULL SAP CALCULATION PRINTOUT

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	0.9332	0.9086	0.8484	0.7340	0.5719	0.3571	0.2239	0.2246	0.4717	0.7466	0.8903	0.9425	(94)
Useful gains	698.2923	757.4543	800.6969	771.0377	617.4207	401.2998	234.9871	225.3566	434.9516	608.2363	658.9169	657.8780	(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	1298.1844	1274.9564	1151.1748	941.8755	671.8431	408.8603	235.9603	226.2988	455.1269	752.8701	1047.0448	1283.5942	(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	446.3197	347.7614	260.7556	123.0032	40.4902	0.0000	0.0000	0.0000	0.0000	107.6076	279.4521	465.5329	(98)
Space heating												2070.9227	(98)
Space heating per m2											(98) / (4) =	24.8134	(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													2283.2665	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	446.3197	347.7614	260.7556	123.0032	40.4902	0.0000	0.0000	0.0000	0.0000	107.6076	279.4521	465.5329	(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)	492.0835	383.4195	287.4924	135.6154	44.6419	0.0000	0.0000	0.0000	0.0000	118.6412	308.1059	513.2667	(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	156.0833	121.6381	98.8234	55.4962	36.1005	9.4312	9.3377	33.1360	56.1088	100.2011	133.1714	157.2188	(64)	
Efficiency of water heater	89.7114	89.7113	89.6521	89.5164	88.9176	87.0000	87.0000	87.0000	87.0000	88.8774	89.4719	89.7365	(217)	
Fuel for water heating, kWh/month	173.9837	135.5884	110.2299	61.9955	40.5999	10.8405	10.7330	38.0874	64.4928	112.7407	148.8416	175.2004	(219)	
Water heating fuel used												1083.3338	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2283.2665	(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)													108.1952	(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													233.1952	(231)
Electricity for lighting (calculated in Appendix L)													356.6393	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.73 * 966 * 1.00) =										-564.0201		-564.0201	(233)	
Total delivered energy for all uses													3392.4148	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2283.2665	3.6300	82.8826 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1083.3338	3.6300	39.3250 (247)
Mechanical ventilation fans	108.1952	19.4400	21.0331 (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	356.6393	19.4400	69.3307 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-564.0201	19.4400	-109.6455 (252)
Total energy cost			222.2259 (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	2283.2665	0.2160	493.1856	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1083.3338	0.2160	234.0001	(264)
Space and water heating			727.1857	(265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Pumps and fans	233.1952	0.5190	121.0283 (267)
Energy for lighting	356.6393	0.5190	185.0958 (268)
Energy saving/generation technologies			
PV Unit	-564.0201	0.5190	-292.7264 (269)
Total kg/year			740.5834 (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	2283.2665	1.2200	2785.5851 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1083.3338	1.2200	1321.6672 (264)
Space and water heating			4107.2523 (265)
Pumps and fans	233.1952	3.0700	715.9093 (267)
Energy for lighting	356.6393	3.0700	1094.8827 (268)
Energy saving/generation technologies			
PV Unit	-564.0201	3.0700	-1731.5416 (269)
Primary energy kWh/year			4186.5028 (272)
Primary energy kWh/m2/year			50.1618 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0647 Plot 6	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	(H/A - SO)
Project	6 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.83	TER	18.55
Environmental	89 B	% DER<TER	20.07		
CO ₂ Emissions (t/year)	0.93	DFEE	45.78	TFEE	54.93
General Requirements Compliance	Pass	% DFEE<TFEE	16.67		

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 6	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	(H/A - SO)
Project	6 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.83	TER	18.55
Environmental	89 B	% DER<TER	20.07		
CO ₂ Emissions (t/year)	0.93	DFEE	45.78	TFEE	54.93
General Requirements Compliance	Pass	% DFEE<TFEE	16.67		

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 6	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	(H/A - SO)
Project	6 Oram Way, WEST END, SO30 3JW		
Calculation Type	New Build (As Built)		

SAP Rating	86 B	DER	14.83	TER	18.55
Environmental	89 B	% DER<TER	20.07		
CO ₂ Emissions (t/year)	0.93	DFEE	45.78	TFEE	54.93
General Requirements Compliance	Pass	% DFEE<TFEE	16.67		

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 = 41.73 m², Perimeter = 18.80 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 6	Issued on Date	16/02/2022
Assessment Reference	As Built	Prop Type Ref	(H/A - SO)
Property	6 Oram Way, WEST END, SO30 3JW		
SAP Rating	86 B	DER	14.83
Environmental	89 B	TER	18.55
CO ₂ Emissions (t/year)	0.93	% DER<TER	20.07
General Requirements Compliance	Pass	DfEE	45.78
		TFEE	54.93
		% DfEE<TFEE	16.67
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	East
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:	18.80 m	41.73 m ²	2.39 m
	1st Storey:	18.80 m	41.73 m ²	2.67 m

7.0 Living Area	15.13	m ²
8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	156.93	kJ/m ² K

9.0 External Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
Brick and Block	Cavity Wall	Other		0.24	42.22	95.13	73.96

9.1 Party Walls				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction				
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				Kappa (kJ/m ² K)	Area (m ²)
Description	Construction				
GF Stud	Plasterboard on timber frame			9.00	77.66
First Floor	Plasterboard on timber frame			9.00	87.30

10.0 External Roofs				U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction					
Pitched Roof	External Plane Roof	Other		0.10	9.10	41.73	41.73

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	41.73

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	41.73

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	41.73

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	East							2.12	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					6.94	
South Elevation	Window	[1] Brick and Block	South	None	0.00					5.40	
North Elevation	Window	[1] Brick and Block	North	None	0.00					6.71	

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)	1.92	0.053	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	11.44	0.043	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.57	0.060	No	Birtley Supatherm
Independently assessed	E3 Sill	14.42	0.034	No	CD0027
Independently assessed	E4 Jamb	33.00	0.039	No	CD0028
Table K1 - Approved	E5 Ground floor (normal)	18.80	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	18.80	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.83	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	9.06	0.054	No	CD0031
Independently assessed	E16 Corner (normal)	20.20	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 0.060 W/m²K

18.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested ?	5.00	m³/(h.m²) @ 50 Pa
As Built AP ₅₀	Yes	
	4.32	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

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17503	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.7	
In Summer	87.0	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	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
0.73	East	45°	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	