



SAP Report Submission for Building Regulations Compliance

Client: The Keen Partnership

Project: Plot 2, 71, Oak Tree Road
Reading, RG31 6LA

Contact: JosTec
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Report Issue Date: 08/04/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

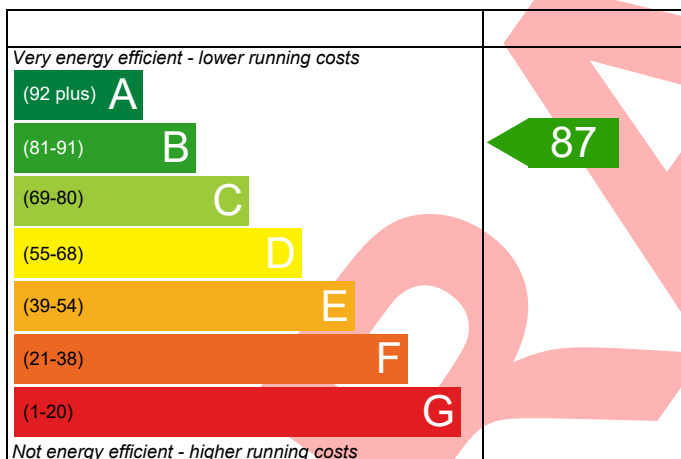
Plot 2, 71, Oak Tree Road,
Reading,
RG31 6LA

Dwelling type: House, Detached
Date of assessment: 08/04/2022
Produced by: Sofia Kymiatzi
Total floor area: 189.79 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

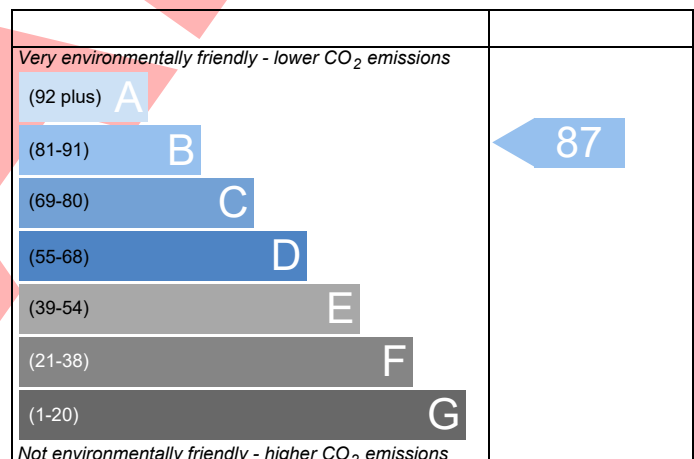


England

EU Directive
2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	22098 - Plot 2	Issued on Date	08/04/2022
Assessment Reference	As Designed	Prop Type Ref	Plot 2
Property	Plot 2, 71, Oak Tree Road, Reading, RG31 6LA		
SAP Rating	87 B	DER	12.63
Environmental	87 B	TER	15.87
CO ₂ Emissions (t/year)	1.99	% DER<TER	20.41
General Requirements Compliance	Pass	DFEE	52.55
		TREE	61.66
		% DFEE<TFEE	14.79
Assessor Details	Miss Sofia Kymiatzi, Sofia Kymiatzi, Tel: 07365 923 614, sofia@jostec.co.uk		Assessor ID
Client	The Keen Partnership, 22098		

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	15.87	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.63	kgCO ₂ /m ²	Pass
	-3.24 (-20.4%)	kgCO ₂ /m ²	

1b TFE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.66	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	52.55	kWh/m ² /yr	
	-9.2 (-14.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Roof	0.17 (max. 0.20)	0.17 (max. 0.35)	Pass
Openings	1.40 (max. 2.00)	1.40 (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	5.00 (design value)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 8000 Style GR8700iW 30 S NG

Efficiency: 89.5% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

Room heaters - Wood Logs
Closed room heater
Efficiency: 65%
Minimum: 65%

Pass

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.78 kWh/day
Permitted by DBSCG 2.56

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

6.28 m², No overhang

Windows facing East

20.30 m², No overhang

Windows facing South

16.55 m², No overhang

Windows facing West

5.02 m², No overhang

Air change rate

8.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value) 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 Designed)

10 Key features

Floor U-value

0.11

W/m²K

Secondary heating (wood logs)

N/A

Secondary heating fuel:

wood logs

Photovoltaic array

1.00

kW

DRAFT

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RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£39	B 88	B 89	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£39	B 88	B 89	

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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Assessment Reference	As Designed			Prop Type Ref	Plot 2	
Property	Plot 2, 71, Oak Tree Road, Reading, RG31 6LA					
SAP Rating		87 B	DER	12.63	TER	15.87
Environmental		87 B	% DER<TER	20.41		
CO ₂ Emissions (t/year)		1.99	DFEE	52.55	TFEE	61.66
General Requirements Compliance		Pass	% DFEE<TFEE	14.79		
Assessor Details	Miss Sofia Kymiatzi, Sofia Kymiatzi, Tel: 07365 923 614, sofia@jostec.co.uk				Assessor ID	U123-0001
Client	The Keen Partnership, 22098					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Detached House, total floor area 190 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) 15.87 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.63 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)52.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.17 (max. 0.20)	0.17 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (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:	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

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

Data from database

Worcester Greenstar 8000 Style GR8700iW 30 S NG

Efficiency: 89.5% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system: Room heaters - Wood Logs

Closed room heater

Efficiency: 65%

Minimum: 65% OK

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.78 kWh/day

Permitted by DBSCG 2.56 OK

Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK

Independent timer for DHW OK

Boiler interlock

Yes OK

7 Low energy lights

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

Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading:	Average
Windows facing North:	6.28 m ² , No overhang
Windows facing East:	20.30 m ² , No overhang
Windows facing South:	16.55 m ² , No overhang
Windows facing West:	5.02 m ² , No overhang
Air change rate:	8.00 ach
Blinds/curtains:	None

10 Key features

Floor U-value 0.11 W/m²K

Secondary heating (wood logs) wood logs

Secondary heating fuel: wood logs

Photovoltaic array 1.00 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	120.9800 (1b)	x 2.6900 (2b)	= 325.4362 (1b) - (3b)
First floor	68.8100 (1c)	x 2.4900 (2c)	= 171.3369 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	189.7900		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 496.7731 (5)
Dwelling volume			

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					50.0000 / (5) = 0.1006 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3506 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3506 (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	0.4471	0.4383	0.4295	0.3857	0.3769	0.3331	0.3331	0.3244	0.3506	0.3769	0.3945	0.4120 (22b)
Effective ac	0.5999	0.5961	0.5923	0.5744	0.5710	0.5555	0.5555	0.5526	0.5615	0.5710	0.5778	0.5849 (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
Windows (Uw = 1.40)			48.1500	1.3258	63.8352		(27)
Entrance Door			3.8800	1.4000	5.4320		(26a)
Ground Floor			120.9800	0.1100	13.3078		(28a)
EW1 - Facing Brick	226.9700	52.0300	174.9400	0.2100	36.7374		(29a)
R1 - Flat ceiling	116.2000		116.2000	0.1700	19.7540		(30)
R2 - Flat Roof (balcony)	4.2500		4.2500	0.1600	0.6800		(30)
Total net area of external elements Aum, m ²			468.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	139.7464		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7995 (36)
Total fabric heat loss						(33) + (36) =	158.5459 (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	98.3511	97.7150	97.0914	94.1623	93.6143	91.0633	91.0633	90.5908	92.0459	93.6143	94.7229	95.8820 (38)
Heat transfer coeff	256.8971	256.2609	255.6373	252.7083	252.1603	249.6092	249.6092	249.1368	250.5918	252.1603	253.2689	254.4279 (39)
Average = Sum(39)m / 12 =												252.7056 (39)
HLP	1.3536	1.3502	1.3469	1.3315	1.3286	1.3152	1.3152	1.3127	1.3204	1.3286	1.3345	1.3406 (40)
HLP (average)												1.3315 (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												2.9886 (42)
Average daily hot water use (litres/day)												105.1797 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	115.6977	111.4905	107.2833	103.0762	98.8690	94.6618	94.6618	98.8690	103.0762	107.2833	111.4905	115.6977 (44)
Energy content (annual)	171.5764	150.0618	154.8503	135.0023	129.5379	111.7814	103.5819	118.8617	120.2813	140.1762	153.0133	166.1626 (45)
Distribution loss (46)m = 0.15 x (45)m	25.7365	22.5093	23.2276	20.2503	19.4307	16.7672	15.5373	17.8293	18.0422	21.0264	22.9520	24.9244 (46)
Water storage loss:												250.0000 (47)
Store volume												1.7800 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9612 (55)
Total storage loss												
	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972 (56)
If cylinder contains dedicated solar storage												
	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222 (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												
	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222 (64)
Heat gains from water heating, kWh/month												
	99.4968	88.2354	93.9354	85.9667	85.5190	78.2457	76.8886	81.9692	81.0719	89.0563	91.9553	97.6967 (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	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	32.2044	28.6037	23.2621	17.6109	13.1643	11.1139	12.0090	15.6097	20.9513	26.6025	31.0490	33.0995 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	361.2355	364.9840	355.5379	335.4284	310.0436	286.1855	270.2468	266.4983	275.9444	296.0540	321.4388	345.2969 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431 (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)												
	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448 (71)
Water heating gains (Table 5)												
	133.7323	131.3027	126.2573	119.3981	114.9449	108.6746	103.3450	110.1736	112.5999	119.6993	127.7157	131.3128 (72)
Total internal gains												
	598.0016	595.7197	575.8866	543.2667	508.9822	476.8033	456.4301	463.1110	480.3249	513.1851	551.0329	580.5385 (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			6.2800		10.6334		0.6300		0.7000		0.7700		20.4081 (74)
East			20.3000		19.6403		0.6300		0.7000		0.7700		121.8471 (76)
South			16.5500		46.7521		0.6300		0.7000		0.7700		236.4670 (78)
West			5.0200		19.6403		0.6300		0.7000		0.7700		30.1316 (80)

Solar gains	408.8539	723.5757	1049.2033	1378.0787	1599.5291	1608.4973	1542.5181	1376.8672	1164.4501	816.9095	494.9698		346.3224 (83)
Total gains	1006.8555	1319.2954	1625.0899	1921.3454	2108.5112	2085.3006	1998.9481	1839.9782	1644.7750	1330.0946	1046.0026		926.8609 (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	20.5216	20.5726	20.6228	20.8618	20.9071	21.1208	21.1208	21.1608	21.0380	20.9071	20.8156	20.7208
alpha	2.3681	2.3715	2.3749	2.3908	2.3938	2.4081	2.4081	2.4107	2.4025	2.3938	2.3877	2.3814
util living area	0.9751	0.9535	0.9155	0.8457	0.7418	0.6080	0.4822	0.5292	0.7235	0.8922	0.9606	0.9793 (86)
MIT	18.7052	18.9938	19.4209	19.9363	20.3690	20.6687	20.7991	20.7738	20.5293	19.9337	19.2186	18.6580 (87)
Th 2	19.7991	19.8017	19.8042	19.8162	19.8185	19.8290	19.8290	19.8309	19.8249	19.8185	19.8139	19.8092 (88)
util rest of house	0.9709	0.9459	0.9015	0.8191	0.6949	0.5309	0.3749	0.4223	0.6565	0.8677	0.9529	0.9759 (89)
MIT 2	16.7320	17.1506	17.7651	18.4997	19.0880	19.4724	19.6109	19.5922	19.3153	18.5150	17.4889	16.6697 (90)
Living area fraction												
MIT	17.1606	17.5510	18.1248	18.8118	19.3663	19.7323	19.8690	19.8489	19.5790	18.8232	17.8647	17.1017 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.0106	17.4010	17.9748	18.6618	19.2163	19.5823	19.7190	19.6989	19.4290	18.6732	17.7147	16.9517 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9565	0.9245	0.8730	0.7871	0.6669	0.5127	0.3639	0.4088	0.6296	0.8362	0.9331	0.9633 (94)
Useful gains	963.0846	1219.6343	1418.6938	1512.3061	1406.1839	1069.0629	727.4092	752.2520	1035.6089	1112.2672	976.0549	892.8609 (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	3265.3238	3203.5172	2933.3926	2466.8792	1895.3113	1243.6313	778.5368	821.8727	1335.4131	2035.7433	2688.3652	3244.3783 (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	1712.8660	1333.1693	1126.9359	687.2927	363.9108	0.0000	0.0000	0.0000	0.0000	687.0662	1232.8634	1749.5290 (98)
Space heating												8893.6333 (98)
Space heating per m2												(98) / (4) = 46.8604 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.1000 (201)
Fraction of space heat from main system(s)													0.9000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													65.0000 (208)
Space heating requirement													8844.4972 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1712.8660	1333.1693	1126.9359	687.2927	363.9108	0.0000	0.0000	0.0000	0.0000	687.0662	1232.8634	1749.5290	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1703.4026	1325.8038	1120.7098	683.4955	361.9002	0.0000	0.0000	0.0000	0.0000	683.2703	1226.0520	1739.8631	(211)
Water heating requirement	263.5178	205.1030	173.3748	105.7373	55.9863	0.0000	0.0000	0.0000	0.0000	105.7025	189.6713	269.1583	(215)
Water heating requirement	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222	(64)
Efficiency of water heater (217)m	88.9825	88.8133	88.4817	87.7752	86.3553	79.8000	79.8000	79.8000	79.8000	87.7002	88.6512	79.8000	(216)
Fuel for water heating, kWh/month	252.4495	222.9245	234.9751	212.3040	211.4491	204.4228	196.2926	215.4402	215.0743	220.3369	230.5229	246.2039	(219)
Water heating fuel used												2662.3957	(219)
Annual totals kWh/year													
Space heating fuel - main system												8844.4972	(211)
Space heating fuel - secondary												1368.2513	(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)												568.7400	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												12655.2644	(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	8844.4972	0.2160	1910.4114 (261)
Space heating - secondary	1368.2513	0.0190	25.9968 (263)
Water heating (other fuel)	2662.3957	0.2160	575.0775 (264)
Space and water heating			2511.4856 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	568.7400	0.5190	295.1760 (268)
Energy saving/generation technologies			
PV Unit	-863.6197	0.5190	-448.2186 (269)
Total CO2, kg/year			2397.3680 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.6300 (273)

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

DER		12.6300	ZC1
Total Floor Area	TFA	189.7900	
Assumed number of occupants	N	2.9886	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		11.2788	ZC2
CO2 emissions from cooking, equation (L16)		1.0049	ZC3
Total CO2 emissions		24.9137	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		24.9137	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	120.9800 (1b)	x 2.6900 (2b)	= 325.4362 (1b) - (3b)
First floor	68.8100 (1c)	x 2.4900 (2c)	= 171.3369 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	189.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 496.7731 (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					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0805 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3305 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3305 (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	0.4214	0.4131	0.4049	0.3636	0.3553	0.3140	0.3140	0.3057	0.3305	0.3553	0.3718	0.3884 (22b)
Effective ac	0.5888	0.5853	0.5820	0.5661	0.5631	0.5493	0.5493	0.5467	0.5546	0.5631	0.5691	0.5754 (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 Semi-glazed door			3.8800	1.2000	4.6560		(26a)
TER Opening Type (Uw = 1.40)			43.5600	1.3258	57.7500		(27)
Ground Floor			120.9800	0.1300	15.7274		(28a)
EW1 - Facing Brick	226.9700	47.4400	179.5300	0.1800	32.3154		(29a)
R1 - Flat ceiling	116.2000		116.2000	0.1300	15.1060		(30)
R2 - Flat Roof (balcony)	4.2500		4.2500	0.1300	0.5525		(30)
Total net area of external elements Aum(A, m ²)			468.4000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		126.1073		(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)							22.3131 (36)
Total fabric heat loss						(33) + (36) =	148.4204 (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	96.5241	95.9588	95.4048	92.8024	92.3155	90.0489	90.0489	89.6292	90.9220	92.3155	93.3005	94.3302 (38)
Heat transfer coeff	244.9445	244.3792	243.8252	241.2228	240.7359	238.4693	238.4693	238.0496	239.3424	240.7359	241.7209	242.7506 (39)
Average = Sum(39)m / 12 =												241.2205 (39)
HLP	1.2906	1.2876	1.2847	1.2710	1.2684	1.2565	1.2565	1.2543	1.2611	1.2684	1.2736	1.2790 (40)
HLP (average)												1.2710 (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												2.9886 (42)
Average daily hot water use (litres/day)												105.1797 (43)
Daily hot water use	115.6977	111.4905	107.2833	103.0762	98.8690	94.6618	94.6618	98.8690	103.0762	107.2833	111.4905	115.6977 (44)
Energy conte	171.5764	150.0618	154.8503	135.0023	129.5379	111.7814	103.5819	118.8617	120.2813	140.1762	153.0133	166.1626 (45)
Energy content (annual)												Total = Sum(45)m = 1654.8870 (45)
Distribution loss (46)m = 0.15 x (45)m	25.7365	22.5093	23.2276	20.2503	19.4307	16.7672	15.5373	17.8293	18.0422	21.0264	22.9520	24.9244 (46)
Water storage loss:												250.0000 (47)
Store volume												1.8903 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0208 (55)
Total storage loss												
31.6444 28.5820 31.6444 30.6236 31.6444 30.6236 31.6444 31.6444 30.6236 31.6444 30.6236 31.6444 (56)												
If cylinder contains dedicated solar storage												
31.6444 28.5820 31.6444 30.6236 31.6444 30.6236 31.6444 31.6444 30.6236 31.6444 30.6236 31.6444 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
226.4832 199.6550 209.7571 188.1379 184.4447 164.9170 158.4886 173.7685 173.4169 195.0830 206.1489 221.0694 (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												
226.4832 199.6550 209.7571 188.1379 184.4447 164.9170 158.4886 173.7685 173.4169 195.0830 206.1489 221.0694 (64)												
Total per year (kWh/year) = Sum(64)m =												2301.3702 (64)
Heat gains from water heating, kWh/month												
100.9746 89.5701 95.4132 87.3967 86.9968 79.6758 78.3664 83.4469 82.5020 90.5340 93.3854 99.1745 (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 149.4310 149.4310 149.4310 149.4310 149.4310 149.4310 149.4310 149.4310 149.4310 149.4310 149.4310 149.4310 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
32.2044 28.6037 23.2621 17.6109 13.1643 11.1139 12.0090 15.6097 20.9513 26.6025 31.0490 33.0995 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
361.2355 364.9840 355.5379 335.4284 310.0436 286.1855 270.2468 266.4983 275.9444 296.0540 321.4388 345.2969 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.9431 37.9431 37.9431 37.9431 37.9431 37.9431 37.9431 37.9431 37.9431 37.9431 37.9431 37.9431 (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)												
-119.5448 -119.5448 -119.5448 -119.5448 -119.5448 -119.5448 -119.5448 -119.5448 -119.5448 -119.5448 -119.5448 -119.5448 (71)												
Water heating gains (Table 5)												
135.7185 133.2889 128.2435 121.3844 116.9312 110.6608 105.3312 112.1599 114.5861 121.6855 129.7020 133.2990 (72)												
Total internal gains	599.9878	597.7059	577.8728	545.2529	510.9684	478.7895	458.4163	465.0972	482.3112	515.1713	553.0191	582.5247 (73)

6. Solar gains

[Jan]					Area	Solar flux		g	FF		Access		Gains
					m2	Table 6a		Specific data	Specific data		factor		W
						W/m2		or Table 6b	or Table 6c		Table 6d		
North					5.6800	10.6334		0.6300	0.7000		0.7700		18.4583 (74)
East					18.3700	19.6403		0.6300	0.7000		0.7700		110.2626 (76)
South					14.9700	46.7521		0.6300	0.7000		0.7700		213.8919 (78)
West					4.5400	19.6403		0.6300	0.7000		0.7700		27.2505 (80)

Solar gains	369.8634	654.5796	949.1731	1246.7128	1447.0651	1455.1823	1395.4905	1245.6217	1053.4394	739.0183	447.7683	313.2942	(83)
Total gains	969.8512	1252.2855	1527.0460	1791.9657	1958.0335	1933.9719	1853.9068	1710.7189	1535.7506	1254.1896	1000.7874	895.8189	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
tau 53.8075 53.9320 54.0546 54.6377 54.7482 55.2686 55.2686 55.3660 55.0670 54.7482 54.5251 54.2938												
alpha 4.5872 4.5955 4.6036 4.6425 4.6499 4.6846 4.6846 4.6911 4.6711 4.6499 4.6350 4.6196												
util living area	0.9990	0.9965	0.9880	0.9572	0.8733	0.7150	0.5482	0.6092	0.8522	0.9795	0.9974	0.9993 (86)
MIT 19.4938 19.7030 20.0211 20.4173 20.7438 20.9304 20.9840 20.9744 20.8338 20.3823 19.8571 19.4611 (87)												
Th 2 19.8482 19.8505 19.8528 19.8636 19.8656 19.8751 19.8751 19.8768 19.8714 19.8656 19.8616 19.8573 (88)												
util rest of house	0.9986	0.9952	0.9835	0.9405	0.8246	0.6172	0.4170	0.4754	0.7774	0.9687	0.9963	0.9990 (89)
MIT 2 17.8413 18.1484 18.6121 19.1833 19.6165 19.8294 19.8694 19.8666 19.7383 19.1451 18.3818 17.7996 (90)												
Living area fraction												
fLA = Living area / (4) =												0.2172 (91)
MIT 18.2003 18.4862 18.9182 19.4513 19.8614 20.0686 20.1116 20.1072 19.9763 19.4139 18.7023 18.1605 (92)												
Temperature adjustment												0.0000
adjusted MIT 18.2003 18.4862 18.9182 19.4513 19.8614 20.0686 20.1116 20.1072 19.9763 19.4139 18.7023 18.1605 (93)												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9977	0.9929	0.9783	0.9327	0.8244	0.6355	0.4456	0.5044	0.7856	0.9626	0.9946	0.9984 (94)
Useful gains	967.6649	1243.4151	1493.9381	1671.3027	1614.2247	1229.0560	826.1844	862.9020	1206.5092	1207.3003	995.3459	894.4072 (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	3404.7969	3320.1765	3027.8647	2545.2234	1964.7493	1304.0917	837.3998	882.5058	1406.4410	2121.8128	2804.5213	3388.9248 (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	1813.2262	1395.5837	1141.2414	629.2229	260.7903	0.0000	0.0000	0.0000	0.0000	680.3973	1302.6063	1855.9211 (98)
Space heating												9078.9892 (98)
Space heating per m2												(98) / (4) = 47.8370 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													9710.1489 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1813.2262	1395.5837	1141.2414	629.2229	260.7903	0.0000	0.0000	0.0000	0.0000	680.3973	1302.6063	1855.9211	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1939.2794	1492.6028	1220.5790	672.9657	278.9201	0.0000	0.0000	0.0000	0.0000	727.6977	1393.1618	1984.9424	(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	226.4832	199.6550	209.7571	188.1379	184.4447	164.9170	158.4886	173.7685	173.4169	195.0830	206.1489	221.0694	(64)
Efficiency of water heater (217)m	89.1724	89.0063	88.6544	87.7905	85.7376	79.8000	79.8000	79.8000	79.8000	87.8745	88.8718	79.8000	(216)
Fuel for water heating, kWh/month	253.9836	224.3156	236.6010	214.3033	215.1270	206.6629	198.6073	217.7550	217.3144	222.0019	231.9621	247.7617	(219)
Water heating fuel used												2686.3958	(219)
Annual totals kWh/year													
Space heating fuel - main system												9710.1489	(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)												568.7400	(232)
Total delivered energy for all uses												13040.2846	(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	9710.1489	0.2160	2097.3922	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2686.3958	0.2160	580.2615	(264)
Space and water heating			2677.6536	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	568.7400	0.5190	295.1760	(268)
Total CO2, kg/m2/year			3011.7547	(272)
Emissions per m2 for space and water heating			14.1085	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			1.5553	(272b)
Emissions per m2 for pumps and fans			0.2051	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1085 * 1.00) + 1.5553 + 0.2051, rounded to 2 d.p.			15.8700	(273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	120.9800 (1b)	x 2.6900 (2b)	= 325.4362 (1b) - (3b)
First floor	68.8100 (1c)	x 2.4900 (2c)	= 171.3369 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	189.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 496.7731 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000	/ (5) =	0.0805 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3305 (18)							
Number of sides sheltered										0 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					1.0000	(20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3305	(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	0.4214	0.4131	0.4049	0.3636	0.3553	0.3140	0.3140	0.3057	0.3305	0.3553	0.3718	0.3884	(22b)				
Effective ac	0.5888	0.5853	0.5820	0.5661	0.5631	0.5493	0.5493	0.5467	0.5546	0.5631	0.5691	0.5754	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Windows (Uw = 1.40)			48.1500	1.3258	63.8352			(27)					
Entrance Door			3.8800	1.4000	5.4320			(26a)					
Ground Floor			120.9800	0.1100	13.3078			(28a)					
EW1 - Facing Brick	226.9700	52.0300	174.9400	0.2100	36.7374			(29a)					
R1 - Flat ceiling	116.2000		116.2000	0.1700	19.7540			(30)					
R2 - Flat Roof (balcony)	4.2500		4.2500	0.1600	0.6800			(30)					
Total net area of external elements Aum(A, m2)			468.4000					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	139.7464		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7995	(36)					
Total fabric heat loss						(33) + (36) =	158.5459	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 96.5241	Feb 95.9588	Mar 95.4048	Apr 92.8024	May 92.3155	Jun 90.0489	Jul 90.0489	Aug 89.6292	Sep 90.9220	Oct 92.3155	Nov 93.3005	Dec 94.3302	(38)
Heat transfer coeff	255.0700	254.5047	253.9507	251.3483	250.8614	248.5948	248.5948	248.1751	249.4679	250.8614	251.8464	252.8762	(39)
Average = Sum(39)m / 12 =												251.3460	(39)
HLP	Jan 1.3440	Feb 1.3410	Mar 1.3381	Apr 1.3243	May 1.3218	Jun 1.3098	Jul 1.3098	Aug 1.3076	Sep 1.3144	Oct 1.3218	Nov 1.3270	Dec 1.3324	(40)
HLP (average)												1.3243	(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												2.9886 (42)
Average daily hot water use (litres/day)												105.1797 (43)
Daily hot water use	Jan 115.6977	Feb 111.4905	Mar 107.2833	Apr 103.0762	May 98.8690	Jun 94.6618	Jul 94.6618	Aug 98.8690	Sep 103.0762	Oct 107.2833	Nov 111.4905	Dec 115.6977 (44)
Energy conte	171.5764	150.0618	154.8503	135.0023	129.5379	111.7814	103.5819	118.8617	120.2813	140.1762	153.0133	166.1626 (45)
Energy content (annual)												Total = Sum(45)m = 1654.8870 (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)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(59)
Heat gains from water heating, kWh/month	36.4600	31.8881	32.9057	28.6880	27.5268	23.7535	22.0111	25.2581	25.5598	29.7875	32.5153	35.3095 (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	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.2044	28.6037	23.2621	17.6109	13.1643	11.1139	12.0090	15.6097	20.9513	26.6025	31.0490	33.0995	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	361.2355	364.9840	355.5379	335.4284	310.0436	286.1855	270.2468	266.4983	275.9444	296.0540	321.4388	345.2969	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	(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)	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	(71)
Water heating gains (Table 5)	49.0054	47.4526	44.2281	39.8444	36.9984	32.9910	29.5849	33.9491	35.4997	40.0369	45.1602	47.4591	(72)
Total internal gains	510.2746	508.8696	490.8574	460.7130	428.0356	398.1197	379.6700	383.8864	400.2247	430.5227	465.4773	493.6847	(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	6.2800	10.6334	0.6300	0.7000	0.7700	20.4081	(74)
East	20.3000	19.6403	0.6300	0.7000	0.7700	121.8471	(76)
South	16.5500	46.7521	0.6300	0.7000	0.7700	236.4670	(78)
West	5.0200	19.6403	0.6300	0.7000	0.7700	30.1316	(80)

Solar gains	408.8539	723.5757	1049.2033	1378.0787	1599.5291	1608.4973	1542.5181	1376.8672	1164.4501	816.9095	494.9698	346.3224	(83)
Total gains	919.1285	1232.4453	1540.0607	1838.7917	2027.5647	2006.6170	1922.1881	1760.7536	1564.6748	1247.4322	960.4471	840.0072	(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	20.6686	20.7145	20.7597	20.9747	21.0154	21.2070	21.2070	21.2428	21.1328	21.0154	20.9332	20.8479	
alpha	2.3779	2.3810	2.3840	2.3983	2.4010	2.4138	2.4138	2.4162	2.4089	2.4010	2.3955	2.3899	
util living area	0.9794	0.9593	0.9232	0.8556	0.7537	0.6215	0.4954	0.5448	0.7395	0.9034	0.9668	0.9833	(86)
MIT	18.0368	18.4261	19.0022	19.6968	20.2849	20.6932	20.8738	20.8372	20.4975	19.6833	18.7187	17.9699	(87)
Th 2	19.8066	19.8089	19.8111	19.8218	19.8238	19.8331	19.8331	19.8349	19.8295	19.8238	19.8198	19.8155	(88)
util rest of house	0.9759	0.9525	0.9102	0.8302	0.7078	0.5446	0.3869	0.4369	0.6741	0.8809	0.9603	0.9804	(89)
MIT 2	17.1090	17.4952	18.0625	18.7401	19.2882	19.6475	19.7796	19.7606	19.4959	18.7443	17.7965	17.0485	(90)
Living area fraction									fLA = Living area / (4) =			0.2172	(91)
MIT	17.3105	17.6974	18.2666	18.9479	19.5047	19.8747	20.0173	19.9945	19.7135	18.9483	17.9968	17.2487	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3105	17.6974	18.2666	18.9479	19.5047	19.8747	20.0173	19.9945	19.7135	18.9483	17.9968	17.2487	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9654	0.9361	0.8883	0.8075	0.6935	0.5476	0.4053	0.4530	0.6665	0.8593	0.9459	0.9714	(94)
Ext temp.	887.3317	1153.7498	1368.1122	1484.8110	1406.1797	1098.8388	779.1346	797.6888	1042.9028	1071.9142	908.4963	815.9702	(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	3318.5993	3257.0115	2988.1436	2525.5227	1957.8974	1311.2545	849.5144	892.0599	1400.3812	2094.2569	2744.3254	3299.6929	(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	1808.8631	1413.3919	1205.3034	749.3124	410.4780	0.0000	0.0000	0.0000	0.0000	760.6230	1321.7970	1847.8897	(98)
Space heating per m2										(98) / (4) =		50.1484	(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	2336.7914	1839.6017	1886.1307	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7283	0.7917	0.7589	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1701.8788	1456.4479	1431.3185	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2483.6728	2381.5967	2195.7501	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													

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Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	562.8917	688.3107	568.7371	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1819.9396 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	140.7229	172.0777	142.1843	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												454.9849 (107)
Energy for space heating												2.3973 (108)
Energy for space cooling												50.1484 (99)
Total												2.3973 (108)
Dwelling Fabric Energy Efficiency (DFEE)												52.5457 (109)
												52.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	120.9800 (1b)	x 2.6900 (2b)	= 325.4362 (1b) - (3b)
First floor	68.8100 (1c)	x 2.4900 (2c)	= 171.3369 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	189.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 496.7731 (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					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0805 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3305 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3305 (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	0.4214	0.4131	0.4049	0.3636	0.3553	0.3140	0.3140	0.3057	0.3305	0.3553	0.3718	0.3884 (22b)
Effective ac	0.5888	0.5853	0.5820	0.5661	0.5631	0.5493	0.5493	0.5467	0.5546	0.5631	0.5691	0.5754 (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 Semi-glazed door			3.8800	1.2000	4.6560		(26a)
TER Opening Type (Uw = 1.40)			43.5600	1.3258	57.7500		(27)
Ground Floor			120.9800	0.1300	15.7274		(28a)
EW1 - Facing Brick	226.9700	47.4400	179.5300	0.1800	32.3154		(29a)
R1 - Flat ceiling	116.2000		116.2000	0.1300	15.1060		(30)
R2 - Flat Roof (balcony)	4.2500		4.2500	0.1300	0.5525		(30)
Total net area of external elements Aum(A, m ²)			468.4000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		126.1073		(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)							22.3131 (36)
Total fabric heat loss						(33) + (36) =	148.4204 (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	96.5241	95.9588	95.4048	92.8024	92.3155	90.0489	90.0489	89.6292	90.9220	92.3155	93.3005	94.3302 (38)
Heat transfer coeff	244.9445	244.3792	243.8252	241.2228	240.7359	238.4693	238.4693	238.0496	239.3424	240.7359	241.7209	242.7506 (39)
Average = Sum(39)m / 12 =												241.2205 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2906	1.2876	1.2847	1.2710	1.2684	1.2565	1.2565	1.2543	1.2611	1.2684	1.2736	1.2790 (40)
HLP (average)												1.2710 (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												2.9886 (42)
Average daily hot water use (litres/day)												105.1797 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.6977	111.4905	107.2833	103.0762	98.8690	94.6618	94.6618	98.8690	103.0762	107.2833	111.4905	115.6977 (44)
Energy conte	171.5764	150.0618	154.8503	135.0023	129.5379	111.7814	103.5819	118.8617	120.2813	140.1762	153.0133	166.1626 (45)
Energy content (annual)										Total = Sum(45)m =		1654.8870 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(59)
Heat gains from water heating, kWh/month	36.4600	31.8881	32.9057	28.6880	27.5268	23.7535	22.0111	25.2581	25.5598	29.7875	32.5153	35.3095 (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	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	149.4310	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.2044	28.6037	23.2621	17.6109	13.1643	11.1139	12.0090	15.6097	20.9513	26.6025	31.0490	33.0995	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	361.2355	364.9840	355.5379	335.4284	310.0436	286.1855	270.2468	266.4983	275.9444	296.0540	321.4388	345.2969	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	37.9431	(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)	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	(71)
Water heating gains (Table 5)	49.0054	47.4526	44.2281	39.8444	36.9984	32.9910	29.5849	33.9491	35.4997	40.0369	45.1602	47.4591	(72)
Total internal gains	510.2746	508.8696	490.8574	460.7130	428.0356	398.1197	379.6700	383.8864	400.2247	430.5227	465.4773	493.6847	(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	5.6800	10.6334	0.6300	0.7000	0.7700	18.4583 (74)
East	18.3700	19.6403	0.6300	0.7000	0.7700	110.2626 (76)
South	14.9700	46.7521	0.6300	0.7000	0.7700	213.8919 (78)
West	4.5400	19.6403	0.6300	0.7000	0.7700	27.2505 (80)

Solar gains	369.8634	654.5796	949.1731	1246.7128	1447.0651	1455.1823	1395.4905	1245.6217	1053.4394	739.0183	447.7683	313.2942	(83)
Total gains	880.1380	1163.4492	1440.0306	1707.4258	1875.1007	1853.3021	1775.1605	1629.5081	1453.6641	1169.5410	913.2456	806.9789	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.8075	53.9320	54.0546	54.6377	54.7482	55.2686	55.2686	55.3660	55.0670	54.7482	54.5251	54.2938	
alpha	4.5872	4.5955	4.6036	4.6425	4.6499	4.6846	4.6846	4.6911	4.6711	4.6499	4.6350	4.6196	
util living area	0.9993	0.9974	0.9905	0.9638	0.8874	0.7359	0.5694	0.6339	0.8718	0.9843	0.9983	0.9995	(86)
MIT	19.4507	19.6608	19.9813	20.3836	20.7215	20.9212	20.9813	20.9698	20.8137	20.3449	19.8152	19.4183	(87)
Th 2	19.8482	19.8505	19.8528	19.8636	19.8656	19.8751	19.8751	19.8768	19.8714	19.8656	19.8616	19.8573	(88)
util rest of house	0.9991	0.9964	0.9868	0.9492	0.8419	0.6388	0.4347	0.4973	0.8020	0.9757	0.9975	0.9994	(89)
MIT 2	18.4349	18.6464	18.9667	19.3679	19.6781	19.8392	19.8705	19.8684	19.7669	19.3379	18.8096	18.4096	(90)
Living area fraction									fLA = Living area / (4) =			0.2172	(91)
MIT	18.6556	18.8668	19.1871	19.5885	19.9048	20.0742	20.1118	20.1077	19.9943	19.5567	19.0280	18.6287	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6556	18.8668	19.1871	19.5885	19.9048	20.0742	20.1118	20.1077	19.9943	19.5567	19.0280	18.6287	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9987	0.9953	0.9840	0.9448	0.8437	0.6577	0.4643	0.5272	0.8111	0.9725	0.9967	0.9991	(94)
Ext temp.	878.9892	1157.9817	1416.9307	1613.0956	1582.0317	1218.8945	824.1717	859.1005	1179.0802	1137.3994	910.2145	806.2740	(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	3516.3267	3413.1983	3093.4330	2578.3116	1975.1830	1305.4377	837.4593	882.6110	1410.7615	2156.1967	2883.2530	3502.5792	(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	1962.1791	1515.5055	1247.3178	694.9556	292.5046	0.0000	0.0000	0.0000	0.0000	757.9851	1420.5877	2006.0510	(98)
										(98) / (4) =		52.1476	(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	2241.6115	1764.6729	1809.1767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8353	0.9027	0.8703	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1872.3831	1592.9200	1574.4918	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2304.4735	2209.7463	2042.3463	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													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	311.1051	458.9188	348.0837	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1118.1076 (104)
Intermittency factor (Table 10b)									FC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	77.7763	114.7297	87.0209	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												279.5269 (107)
Energy for space heating												1.4728 (108)
Energy for space cooling												52.1476 (99)
Total												1.4728 (108)
Target Fabric Energy Efficiency (TFEE)												53.6204 (109)
												61.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	120.9800 (1b)	x 2.6900 (2b)	= 325.4362 (1b) - (3b)
First floor	68.8100 (1c)	x 2.4900 (2c)	= 171.3369 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	189.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 496.7731 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					50.0000 / (5) = 0.1006 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3506 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3506 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.3000	3.5000	3.9000	3.7000	4.1000 (22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.8250	0.8750	0.9750	0.9250	1.0250 (22a)
Adj infilt rate	0.3857	0.3682	0.3682	0.3419	0.3419	0.2981	0.3068	0.2893	0.3068	0.3419	0.3244	0.3594 (22b)
Effective ac	0.5744	0.5678	0.5678	0.5584	0.5584	0.5444	0.5471	0.5418	0.5471	0.5584	0.5526	0.5646 (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
Windows (Uw = 1.40)			48.1500	1.3258	63.8352		(27)
Entrance Door			3.8800	1.4000	5.4320		(26a)
Ground Floor			120.9800	0.1100	13.3078		(28a)
EW1 - Facing Brick	226.9700	52.0300	174.9400	0.2100	36.7374		(29a)
R1 - Flat ceiling	116.2000		116.2000	0.1700	19.7540		(30)
R2 - Flat Roof (balcony)	4.2500		4.2500	0.1600	0.6800		(30)
Total net area of external elements Aum, m ²			468.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	139.7464		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7995 (36)
Total fabric heat loss						(33) + (36) =	158.5459 (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	94.1623	93.0789	93.0789	91.5483	91.5483	89.2492	89.6838	88.8271	89.6838	91.5483	90.5908	92.5561 (38)
Heat transfer coeff	252.7083	251.6248	251.6248	250.0942	250.0942	247.7951	248.2297	247.3730	248.2297	250.0942	249.1368	251.1020 (39)
Average = Sum(39)m / 12 =												249.8422 (39)
HLP	1.3315	1.3258	1.3258	1.3177	1.3177	1.3056	1.3079	1.3034	1.3079	1.3177	1.3127	1.3231 (40)
HLP (average)												1.3164 (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												2.9886 (42)
Average daily hot water use (litres/day)												105.1797 (43)
Daily hot water use	115.6977	111.4905	107.2833	103.0762	98.8690	94.6618	94.6618	98.8690	103.0762	107.2833	111.4905	115.6977 (44)
Energy conte	171.5764	150.0618	154.8503	135.0023	129.5379	111.7814	103.5819	118.8617	120.2813	140.1762	153.0133	166.1626 (45)
Energy content (annual)										Total = Sum(45)m =		1654.8870 (45)
Distribution loss (46)m = 0.15 x (45)m	25.7365	22.5093	23.2276	20.2503	19.4307	16.7672	15.5373	17.8293	18.0422	21.0264	22.9520	24.9244 (46)
Water storage loss:												250.0000 (47)
Store volume												1.7800 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9612 (55)
Total storage loss	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972 (56)
If cylinder contains dedicated solar storage	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222 (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	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222 (64)
RHI water heating demand												2280 (64)
Heat gains from water heating, kWh/month	99.4968	88.2354	93.9354	85.9667	85.5190	78.2457	76.8886	81.9692	81.0719	89.0563	91.9553	97.6967 (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	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.5110	71.5092	58.1552	44.0272	32.9109	27.7847	30.0224	39.0242	52.3782	66.5062	77.6226	82.7487	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	539.1575	544.7523	530.6537	500.6393	462.7516	427.1425	403.3535	397.7587	411.8574	441.8717	479.7594	515.3685	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	(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)	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	(71)
Water heating gains (Table 5)	133.7323	131.3027	126.2573	119.3981	114.9449	108.6746	103.3450	110.1736	112.5999	119.6993	127.7157	131.3128	(72)
Total internal gains	872.0936	866.2569	833.7589	782.7574	729.3002	682.2946	655.4136	665.6494	695.5283	746.7699	803.7904	848.1227	(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			6.2800		12.7650	0.6300		0.7000		0.7700		24.4993 (74)
East			20.3000		23.8018	0.6300		0.7000		0.7700		147.6648 (76)
South			16.5500		54.2217	0.6300		0.7000		0.7700		274.2477 (78)
West			5.0200		23.8018	0.6300		0.7000		0.7700		36.5161 (80)
Solar gains	482.9280	747.3567	1078.1365	1443.1595	1637.6367	1744.7321	1655.5344	1502.2220	1277.3069	906.1693	576.0207	411.3936 (83)
Total gains	1355.0216	1613.6136	1911.8954	2225.9169	2366.9369	2427.0268	2310.9480	2167.8713	1972.8351	1652.9393	1379.8112	1259.5163 (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	20.8618	20.9516	20.9516	21.0798	21.0798	21.2754	21.2382	21.3117	21.2382	21.0798	21.1608	20.9952
alpha	2.3908	2.3968	2.3968	2.4053	2.4053	2.4184	2.4159	2.4208	2.4159	2.4053	2.4107	2.3997
util living area	0.9507	0.9265	0.8762	0.7851	0.6632	0.4839	0.3531	0.3903	0.6215	0.8264	0.9246	0.9573 (86)
MIT	19.0413	19.2710	19.6923	20.1691	20.5344	20.7797	20.8538	20.8430	20.6632	20.1815	19.5437	18.9988 (87)
Th 2	19.8162	19.8207	19.8207	19.8270	19.8270	19.8364	19.8346	19.8382	19.8346	19.8270	19.8309	19.8228 (88)
util rest of house	0.9427	0.9150	0.8564	0.7504	0.6066	0.3982	0.2441	0.2792	0.5434	0.7899	0.9105	0.9503 (89)
MIT 2	17.2279	17.5595	18.1579	18.8213	19.3008	19.5927	19.6572	19.6541	19.4738	18.8560	17.9641	17.1716 (90)
Living area fraction	17.6218	17.9313	18.4912	19.1141	19.5688	19.8506	19.9172	19.9124	19.7322	19.1439	18.3072	17.5685 (92)
MIT	17.6218	17.9313	18.4912	19.1141	19.5688	19.8506	19.9172	19.9124	19.7322	19.1439	18.3072	17.5685 (91)
Temperature adjustment	17.4718	17.7813	18.3412	18.9641	19.4188	19.7006	19.7672	19.7624	19.5822	18.9939	18.1572	17.4185 (93)
adjusted MIT	17.4718	17.7813	18.3412	18.9641	19.4188	19.7006	19.7672	19.7624	19.5822	18.9939	18.1572	17.4185 (93)
												-0.1500

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	1247.7315	1433.6212	1577.9465	1603.4465	1383.1974	940.3080	548.6299	588.5959	1034.2392	1252.7060	1218.8265	1171.5053	(95)
Ext temp.	4.9000	5.4000	7.2000	9.7000	12.6000	15.6000	17.5000	17.3000	14.7000	11.3000	7.8000	4.9000	(96)
Heat loss rate W	3177.0079	3115.4378	2803.4111	2316.9001	1705.3334	1016.0983	562.7747	609.1313	1211.9044	1924.2036	2580.3698	3143.4278	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1435.3816	1130.1807	911.7456	513.6866	239.6691	0.0000	0.0000	0.0000	0.0000	499.5942	980.3112	1467.1104	(98)
Space heating												7177.6795	(98)
RHI space heating demand												7178	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	120.9800 (1b)	x 2.6900 (2b)	= 325.4362 (1b) - (3b)
First floor	68.8100 (1c)	x 2.4900 (2c)	= 171.3369 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	189.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 496.7731 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				50.0000 / (5) =	0.1006 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3506 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3506 (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	0.4471	0.4383	0.4295	0.3857	0.3769	0.3331	0.3331	0.3244	0.3506	0.3769	0.3945	0.4120 (22b)
Effective ac	0.5999	0.5961	0.5923	0.5744	0.5710	0.5555	0.5555	0.5526	0.5615	0.5710	0.5778	0.5849 (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
Windows (Uw = 1.40)			48.1500	1.3258	63.8352		(27)
Entrance Door			3.8800	1.4000	5.4320		(26a)
Ground Floor			120.9800	0.1100	13.3078		(28a)
EW1 - Facing Brick	226.9700	52.0300	174.9400	0.2100	36.7374		(29a)
R1 - Flat ceiling	116.2000		116.2000	0.1700	19.7540		(30)
R2 - Flat Roof (balcony)	4.2500		4.2500	0.1600	0.6800		(30)
Total net area of external elements Aum(A, m ²)			468.4000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		139.7464		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7995 (36)
Total fabric heat loss						(33) + (36) =	158.5459 (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	98.3511	97.7150	97.0914	94.1623	93.6143	91.0633	91.0633	90.5908	92.0459	93.6143	94.7229	95.8820 (38)
Heat transfer coeff	256.8971	256.2609	255.6373	252.7083	252.1603	249.6092	249.6092	249.1368	250.5918	252.1603	253.2689	254.4279 (39)
Average = Sum(39)m / 12 =												252.7056 (39)
HLP	1.3536	1.3502	1.3469	1.3315	1.3286	1.3152	1.3152	1.3127	1.3204	1.3286	1.3345	1.3406 (40)
HLP (average)												1.3315 (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												2.9886 (42)
Average daily hot water use (litres/day)												105.1797 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	115.6977	111.4905	107.2833	103.0762	98.8690	94.6618	94.6618	98.8690	103.0762	107.2833	111.4905	115.6977 (44)
Energy content (annual)	171.5764	150.0618	154.8503	135.0023	129.5379	111.7814	103.5819	118.8617	120.2813	140.1762	153.0133	166.1626 (45)
Distribution loss (46)m = 0.15 x (45)m	25.7365	22.5093	23.2276	20.2503	19.4307	16.7672	15.5373	17.8293	18.0422	21.0264	22.9520	24.9244 (46)
Water storage loss:												250.0000 (47)
Store volume												1.7800 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9612 (55)
Total storage loss	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972 (56)
If cylinder contains dedicated solar storage	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222 (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	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222 (64)
Heat gains from water heating, kWh/month	99.4968	88.2354	93.9354	85.9667	85.5190	78.2457	76.8886	81.9692	81.0719	89.0563	91.9553	97.6967 (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	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.5110	71.5092	58.1552	44.0272	32.9109	27.7847	30.0224	39.0242	52.3782	66.5062	77.6226	82.7487	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	539.1575	544.7523	530.6537	500.6393	462.7516	427.1425	403.3535	397.7587	411.8574	441.8717	479.7594	515.3685	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	(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)	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	(71)
Water heating gains (Table 5)	133.7323	131.3027	126.2573	119.3981	114.9449	108.6746	103.3450	110.1736	112.5999	119.6993	127.7157	131.3128	(72)
Total internal gains	872.0936	866.2569	833.7589	782.7574	729.3002	682.2946	655.4136	665.6494	695.5283	746.7699	803.7904	848.1227	(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				6.2800	10.6334	0.6300	0.7000	0.7700	20.4081	(74)			
East				20.3000	19.6403	0.6300	0.7000	0.7700	121.8471	(76)			
South				16.5500	46.7521	0.6300	0.7000	0.7700	236.4670	(78)			
West				5.0200	19.6403	0.6300	0.7000	0.7700	30.1316	(80)			
Solar gains	408.8539	723.5757	1049.2033	1378.0787	1599.5291	1608.4973	1542.5181	1376.8672	1164.4501	816.9095	494.9698	346.3224	(83)
Total gains	1280.9475	1589.8326	1882.9622	2160.8362	2328.8292	2290.7919	2197.9317	2042.5166	1859.9783	1563.6795	1298.7602	1194.4452	(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	20.5216	20.5726	20.6228	20.8618	20.9071	21.1208	21.1208	21.1608	21.0380	20.9071	20.8156	20.7208
alpha	2.3681	2.3715	2.3749	2.3908	2.3938	2.4081	2.4081	2.4107	2.4025	2.3938	2.3877	2.3814
util living area	0.9592	0.9333	0.8904	0.8151	0.7078	0.5721	0.4478	0.4900	0.6799	0.8584	0.9396	0.9649 (86)
MIT	18.8681	19.1429	19.5456	20.0270	20.4250	20.6972	20.8127	20.7920	20.5790	20.0371	19.3616	18.8202 (87)
Th 2	19.7991	19.8017	19.8042	19.8162	19.8185	19.8290	19.8290	19.8309	19.8249	19.8185	19.8139	19.8092 (88)
util rest of house	0.9527	0.9229	0.8731	0.7854	0.6587	0.4956	0.3453	0.3871	0.6102	0.8287	0.9284	0.9593 (89)
MIT 2	16.9665	17.3628	17.9385	18.6196	19.1550	19.5000	19.6201	19.6055	19.3692	18.6530	17.6921	16.9038 (90)
Living area fraction	17.3796	17.7495	18.2876	18.9254	19.4309	19.7601	19.8792	19.8633	19.6320	18.9537	18.0548	17.3201 (91)
MIT	17.3796	17.7495	18.2876	18.9254	19.4309	19.7601	19.8792	19.8633	19.6320	18.9537	18.0548	17.3201 (92)
Temperature adjustment	17.2296	17.5995	18.1376	18.7754	19.2809	19.6101	19.7292	19.7133	19.4820	18.8037	17.9048	-0.1500
adjusted MIT	17.2296	17.5995	18.1376	18.7754	19.2809	19.6101	19.7292	19.7133	19.4820	18.8037	17.9048	17.1701 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9330	0.8973	0.8425	0.7540	0.6331	0.4798	0.3358	0.3757	0.5866	0.7963	0.9036	0.9414	(94)
Ext temp.	1195.0657	1426.5237	1586.3472	1629.1968	1474.3839	1099.1277	738.1216	767.4466	1091.1438	1245.1100	1173.6088	1124.4262	(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	3321.5756	3254.3805	2975.0125	2495.5846	1911.6043	1250.5735	781.0734	825.4582	1348.6879	2068.6474	2736.5231	3299.9659	(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	1582.1233	1228.3198	1033.1670	623.7993	325.2919	0.0000	0.0000	0.0000	0.0000	612.7119	1125.2983	1618.6015	(98)
Space heating per m2													(98) / (4) = 42.9386 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.1000 (201)
Fraction of space heat from main system(s)													0.9000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													65.0000 (208)
Space heating requirement													8104.2891 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1582.1233	1228.3198	1033.1670	623.7993	325.2919	0.0000	0.0000	0.0000	0.0000	612.7119	1125.2983	1618.6015	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1573.3823	1221.5335	1027.4589	620.3529	323.4947	0.0000	0.0000	0.0000	0.0000	609.3267	1119.0811	1609.6589	(211)
Water heating requirement	243.4036	188.9723	158.9488	95.9691	50.0449	0.0000	0.0000	0.0000	0.0000	94.2634	173.1228	249.0156	(215)
Water heating requirement	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222	(64)
Efficiency of water heater (217)m	88.8762	88.6936	88.3356	87.5737	86.0671	79.8000	79.8000	79.8000	79.8000	87.4570	88.5074	79.8000	(216)
Fuel for water heating, kWh/month	252.7517	223.2253	235.3637	212.7925	212.1572	204.4228	196.2926	215.4402	215.0743	220.9494	230.8975	246.4829	(219)
Water heating fuel used												2665.8500	(219)
Annual totals kWh/year													
Space heating fuel - main system												8104.2891	(211)
Space heating fuel - secondary												1253.7404	(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)												568.7400	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												11803.9998	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	8104.2891	3.4800	282.0293 (240)
Space heating - secondary	1253.7404	4.2300	53.0332 (242)
Water heating (other fuel)	2665.8500	3.4800	92.7716 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	568.7400	13.1900	75.0168 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-863.6197	13.1900	-113.9114 (252)
Total energy cost			518.8319 (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] =	0.9281 (257)
SAP value		87.0530
SAP rating (Section 12)		87 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	8104.2891	0.2160	1750.5264 (261)
Space heating - secondary	1253.7404	0.0190	23.8211 (263)
Water heating (other fuel)	2665.8500	0.2160	575.8236 (264)
Space and water heating			2350.1711 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	568.7400	0.5190	295.1760 (268)
Energy saving/generation technologies			
PV Unit	-863.6197	0.5190	-448.2186 (269)
Total kg/year			2236.0535 (272)
CO2 emissions per m2			11.7800 (273)
EI value			87.2383
EI rating			87 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.25) / 0.9050 = 4.124$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.25) / 0.9050 = 0.2560$, stars = 4
Water heating energy efficiency	$3.48 / 0.8530 = 4.080$, stars = 4
Water heating environmental impact	$0.216 / 0.8530 = 0.2532$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	120.9800 (1b)	x 2.6900 (2b)	= 325.4362 (1b) - (3b)
First floor	68.8100 (1c)	x 2.4900 (2c)	= 171.3369 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	189.7900		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 496.7731 (5)
Dwelling volume			

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					50.0000 / (5) = 0.1006 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3506 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3506 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.3000	3.5000	3.9000	3.7000	4.1000 (22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.8250	0.8750	0.9750	0.9250	1.0250 (22a)
Adj infilt rate												
Effective ac	0.3857	0.3682	0.3682	0.3419	0.3419	0.2981	0.3068	0.2893	0.3068	0.3419	0.3244	0.3594 (22b)
	0.5744	0.5678	0.5678	0.5584	0.5584	0.5444	0.5471	0.5418	0.5471	0.5584	0.5526	0.5646 (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
Windows (Uw = 1.40)			48.1500	1.3258	63.8352		(27)
Entrance Door			3.8800	1.4000	5.4320		(26a)
Ground Floor			120.9800	0.1100	13.3078		(28a)
EW1 - Facing Brick	226.9700	52.0300	174.9400	0.2100	36.7374		(29a)
R1 - Flat ceiling	116.2000		116.2000	0.1700	19.7540		(30)
R2 - Flat Roof (balcony)	4.2500		4.2500	0.1600	0.6800		(30)
Total net area of external elements Aum, m ²			468.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	139.7464		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7995 (36)
Total fabric heat loss						(33) + (36) =	158.5459 (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	94.1623	93.0789	93.0789	91.5483	91.5483	89.2492	89.6838	88.8271	89.6838	91.5483	90.5908	92.5561 (38)
Heat transfer coeff	252.7083	251.6248	251.6248	250.0942	250.0942	247.7951	248.2297	247.3730	248.2297	250.0942	249.1368	251.1020 (39)
Average = Sum(39)m / 12 =												249.8422 (39)
HLP	1.3315	1.3258	1.3258	1.3177	1.3177	1.3056	1.3079	1.3034	1.3079	1.3177	1.3127	1.3231 (40)
HLP (average)												1.3164 (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												2.9886 (42)
Average daily hot water use (litres/day)												105.1797 (43)
Daily hot water use	115.6977	111.4905	107.2833	103.0762	98.8690	94.6618	94.6618	98.8690	103.0762	107.2833	111.4905	115.6977 (44)
Energy conte	171.5764	150.0618	154.8503	135.0023	129.5379	111.7814	103.5819	118.8617	120.2813	140.1762	153.0133	166.1626 (45)
Energy content (annual)										Total = Sum(45)m =		1654.8870 (45)
Distribution loss (46)m = 0.15 x (45)m	25.7365	22.5093	23.2276	20.2503	19.4307	16.7672	15.5373	17.8293	18.0422	21.0264	22.9520	24.9244 (46)
Water storage loss:												250.0000 (47)
Store volume												1.7800 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9612 (55)
Total storage loss	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972 (56)
If cylinder contains dedicated solar storage	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222 (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	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222 (64)
Heat gains from water heating, kWh/month	99.4968	88.2354	93.9354	85.9667	85.5190	78.2457	76.8886	81.9692	81.0719	89.0563	91.9553	97.6967 (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	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.5110	71.5092	58.1552	44.0272	32.9109	27.7847	30.0224	39.0242	52.3782	66.5062	77.6226	82.7487	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	539.1575	544.7523	530.6537	500.6393	462.7516	427.1425	403.3535	397.7587	411.8574	441.8717	479.7594	515.3685	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	(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)	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	(71)
Water heating gains (Table 5)	133.7323	131.3027	126.2573	119.3981	114.9449	108.6746	103.3450	110.1736	112.5999	119.6993	127.7157	131.3128	(72)
Total internal gains	872.0936	866.2569	833.7589	782.7574	729.3002	682.2946	655.4136	665.6494	695.5283	746.7699	803.7904	848.1227	(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				6.2800	12.7650	0.6300	0.7000	0.7700		24.4993 (74)		
East				20.3000	23.8018	0.6300	0.7000	0.7700		147.6648 (76)		
South				16.5500	54.2217	0.6300	0.7000	0.7700		274.2477 (78)		
West				5.0200	23.8018	0.6300	0.7000	0.7700		36.5161 (80)		
Solar gains	482.9280	747.3567	1078.1365	1443.1595	1637.6367	1744.7321	1655.5344	1502.2220	1277.3069	906.1693	576.0207	411.3936 (83)
Total gains	1355.0216	1613.6136	1911.8954	2225.9169	2366.9369	2427.0268	2310.9480	2167.8713	1972.8351	1652.9393	1379.8112	1259.5163 (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	20.8618	20.9516	20.9516	21.0798	21.0798	21.2754	21.2382	21.3117	21.2382	21.0798	21.1608	20.9952
alpha	2.3908	2.3968	2.3968	2.4053	2.4053	2.4184	2.4159	2.4208	2.4159	2.4053	2.4107	2.3997
util living area	0.9507	0.9265	0.8762	0.7851	0.6632	0.4839	0.3531	0.3903	0.6215	0.8264	0.9246	0.9573 (86)
MIT	19.0413	19.2710	19.6923	20.1691	20.5344	20.7797	20.8538	20.8430	20.6632	20.1815	19.5437	18.9988 (87)
Th 2	19.8162	19.8207	19.8207	19.8270	19.8270	19.8364	19.8346	19.8382	19.8346	19.8270	19.8309	19.8228 (88)
util rest of house	0.9427	0.9150	0.8564	0.7504	0.6066	0.3982	0.2441	0.2792	0.5434	0.7899	0.9105	0.9503 (89)
MIT 2	17.2279	17.5595	18.1579	18.8213	19.3008	19.5927	19.6572	19.6541	19.4738	18.8560	17.9641	17.1716 (90)
Living area fraction	17.6218	17.9313	18.4912	19.1141	19.5688	19.8506	19.9172	19.9124	19.7322	19.1439	18.3072	17.5685 (92)
MIT	17.6218	17.9313	18.4912	19.1141	19.5688	19.8506	19.9172	19.9124	19.7322	19.1439	18.3072	17.5685 (92)
Temperature adjustment	17.4718	17.7813	18.3412	18.9641	19.4188	19.7006	19.7672	19.7624	19.5822	18.9939	18.1572	-0.1500
adjusted MIT	17.4718	17.7813	18.3412	18.9641	19.4188	19.7006	19.7672	19.7624	19.5822	18.9939	18.1572	17.4185 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	1247.7315	1433.6212	1577.9465	1603.4465	1383.1974	940.3080	548.6299	588.5959	1034.2392	1252.7060	1218.8265	1171.5053	(94)
Ext temp.	4.9000	5.4000	7.2000	9.7000	12.6000	15.6000	17.5000	17.3000	14.7000	11.3000	7.8000	4.9000	(96)
Heat loss rate W	3177.0079	3115.4378	2803.4111	2316.9001	1705.3334	1016.0983	562.7747	609.1313	1211.9044	1924.2036	2580.3698	3143.4278	(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	1435.3816	1130.1807	911.7456	513.6866	239.6691	0.0000	0.0000	0.0000	0.0000	499.5942	980.3112	1467.1104	(98)
Space heating												7177.6795	(98)
Space heating per m2												37.8191	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.1000 (201)
Fraction of space heat from main system(s)													0.9000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													65.0000 (208)
Space heating requirement													7138.0238 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1435.3816	1130.1807	911.7456	513.6866	239.6691	0.0000	0.0000	0.0000	0.0000	499.5942	980.3112	1467.1104	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1427.4513	1123.9366	906.7084	510.8485	238.3450	0.0000	0.0000	0.0000	0.0000	496.8341	974.8951	1459.0048	(211)
Water heating requirement	220.8279	173.8740	140.2686	79.0287	36.8722	0.0000	0.0000	0.0000	0.0000	76.8607	150.8171	225.7093	(215)
Water heating requirement	224.6360	197.9866	207.9099	186.3503	182.5975	163.1294	156.6415	171.9213	171.6293	193.2358	204.3613	219.2222	(64)
Efficiency of water heater (217)m	88.7375	88.5651	88.1117	87.1432	85.2591	79.8000	79.8000	79.8000	79.8000	86.9938	88.2740	79.8000	(216)
Fuel for water heating, kWh/month	253.1466	223.5491	235.9618	213.8437	214.1678	204.4228	196.2926	215.4402	215.0743	222.1259	231.5080	246.8592	(219)
Water heating fuel used												2672.3919	(219)
Annual totals kWh/year													
Space heating fuel - main system												7138.0238	(211)
Space heating fuel - secondary												1104.2584	(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)												568.7400	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1169 * 1.00) =										-935.0412		-935.0412	(233)
Total delivered energy for all uses												10623.3728	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	7138.0238	3.6300	259.1103 (240)
Space heating - secondary	1104.2584	5.1600	56.9797 (242)
Water heating (other fuel)	2672.3919	3.6300	97.0078 (247)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	568.7400	19.4400	110.5631 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-935.0412	19.4400	-181.7720 (252)
Total energy cost			451.4689 (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	7138.0238	0.2160	1541.8131 (261)
Space heating - secondary	1104.2584	0.0190	20.9809 (263)
Water heating (other fuel)	2672.3919	0.2160	577.2367 (264)
Space and water heating			2140.0307 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	568.7400	0.5190	295.1760 (268)
Energy saving/generation technologies			
PV Unit	-935.0412	0.5190	-485.2864 (269)
Total kg/year			1988.8454 (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	7138.0238	1.2200	8708.3890 (261)
Space heating - secondary	1104.2584	1.0400	1148.4287 (263)
Water heating (other fuel)	2672.3919	1.2200	3260.3181 (264)
Space and water heating			13117.1359 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	568.7400	3.0700	1746.0317 (268)
Energy saving/generation technologies			
PV Unit	-935.0412	3.0700	-2870.5765 (269)
Primary energy kWh/year			12222.8411 (272)
Primary energy kWh/m2/year			64.4019 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 EPC IMPROVEMENTS

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

(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	+ 1.0	-£ 39	-268 kg (13.5%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£39	1.41 kg/m ²	B 88	B 89
Total Savings	£39	1.41 kg/m ²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 500 TEST (30 Jun 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£125	£135	-£10
Mains gas	£451	£402	£49
Wood	£57	£57	-£0
Space heating	£426	£427	-£1
Water heating	£97	£56	£41
Lighting	£111	£111	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£451	£412	£39
Total cost of uses	£452	£412	£40
Delivered energy	56 kWh/m ²	49 kWh/m ²	7 kWh/m ²
Carbon dioxide emissions	2.0 tonnes	1.7 tonnes	0.3 tonnes
CO2 emissions per m ²	10 kg/m ²	9 kg/m ²	1 kg/m ²
Primary energy	64 kWh/m ²	56 kWh/m ²	8 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	120.9800 (1b)	x 2.6900 (2b)	= 325.4362 (1b) - (3b)
First floor	68.8100 (1c)	x 2.4900 (2c)	= 171.3369 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	189.7900		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 496.7731 (5)
Dwelling volume			

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																5 * 10 =	50.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					50.0000	/ (5) =	0.1006 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3506 (18)							
Number of sides sheltered										0 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					1.0000	(20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3506	(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	0.4471	0.4383	0.4295	0.3857	0.3769	0.3331	0.3331	0.3244	0.3506	0.3769	0.3945	0.4120	(22b)				
Effective ac	0.5999	0.5961	0.5923	0.5744	0.5710	0.5555	0.5555	0.5526	0.5615	0.5710	0.5778	0.5849	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Windows (Uw = 1.40)			48.1500	1.3258	63.8352			(27)					
Entrance Door			3.8800	1.4000	5.4320			(26a)					
Ground Floor			120.9800	0.1100	13.3078			(28a)					
EW1 - Facing Brick	226.9700	52.0300	174.9400	0.2100	36.7374			(29a)					
R1 - Flat ceiling	116.2000		116.2000	0.1700	19.7540			(30)					
R2 - Flat Roof (balcony)	4.2500		4.2500	0.1600	0.6800			(30)					
Total net area of external elements Aum(A, m2)			468.4000					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	139.7464		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7995	(36)					
Total fabric heat loss						(33) + (36) =	158.5459	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 98.3511	Feb 97.7150	Mar 97.0914	Apr 94.1623	May 93.6143	Jun 91.0633	Jul 91.0633	Aug 90.5908	Sep 92.0459	Oct 93.6143	Nov 94.7229	Dec 95.8820	(38)
Heat transfer coeff	256.8971	256.2609	255.6373	252.7083	252.1603	249.6092	249.6092	249.1368	250.5918	252.1603	253.2689	254.4279	(39)
Average = Sum(39)m / 12 =												252.7056	(39)
HLP	Jan 1.3536	Feb 1.3502	Mar 1.3469	Apr 1.3315	May 1.3286	Jun 1.3152	Jul 1.3152	Aug 1.3127	Sep 1.3204	Oct 1.3286	Nov 1.3345	Dec 1.3406	(40)
HLP (average)												1.3315	(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												2.9886 (42)
Average daily hot water use (litres/day)												105.1797 (43)
Daily hot water use	Jan 115.6977	Feb 111.4905	Mar 107.2833	Apr 103.0762	May 98.8690	Jun 94.6618	Jul 94.6618	Aug 98.8690	Sep 103.0762	Oct 107.2833	Nov 111.4905	Dec 115.6977 (44)
Energy conte	171.5764	150.0618	154.8503	135.0023	129.5379	111.7814	103.5819	118.8617	120.2813	140.1762	153.0133	166.1626 (45)
Energy content (annual)												Total = Sum(45)m = 1654.8870 (45)
Distribution loss (46)m = 0.15 x (45)m	25.7365	22.5093	23.2276	20.2503	19.4307	16.7672	15.5373	17.8293	18.0422	21.0264	22.9520	24.9244 (46)
Water storage loss:												250.0000 (47)
Store volume												1.7800 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9612 (55)
Total storage loss													
	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(56)
If cylinder contains dedicated solar storage													
	20.8580	18.8395	20.8580	20.1852	20.8580	20.1852	20.8580	20.8580	20.1852	20.8580	20.1852	20.8580	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	215.6968	189.9125	197.5750	170.9459	160.8640	141.8718	134.6754	150.8857	157.5756	182.9009	195.7105	210.2830	(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													1.0959 (H8)
Utilisation factor													0.5985 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													127.5000 (H13)
Daily hot water demand													105.1797 (H14)
Volume ratio Veff/V													1.2122 (H15)
Solar storage volume factor													1.0000 (H16)
Solar input													-954.3815 (H17)
Solar input	-27.6752	-46.1819	-78.6530	-105.4106	-130.2259	-128.0328	-126.3408	-110.3846	-86.4533	-59.0374	-32.8267	-23.1594	(63)
								Solar input (sum of months) = Sum (63)m =					-954.3815 (63)
Output from w/h													
	188.0217	143.7306	118.9220	65.5353	30.6381	13.8390	8.3346	40.5011	71.1223	123.8635	162.8838	187.1236	(64)
								Total per year (kWh/year) = Sum (64)m =					1154.5157 (64)
Heat gains from water heating, kWh/month													
	92.3455	81.7761	85.6675	73.6431	68.1322	61.2397	59.3158	65.1407	69.8290	80.7884	85.0347	90.5454	(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	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	80.5110	71.5092	58.1552	44.0272	32.9109	27.7847	30.0224	39.0242	52.3782	66.5062	77.6226	82.7487 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	539.1575	544.7523	530.6537	500.6393	462.7516	427.1425	403.3535	397.7587	411.8574	441.8717	479.7594	515.3685 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203 (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)												
	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448 (71)
Water heating gains (Table 5)												
	124.1203	121.6907	115.1445	102.2821	91.5756	85.0551	79.7255	87.5547	96.9847	108.5865	118.1037	121.7008 (72)
Total internal gains												
	862.4816	856.6449	822.6461	765.6414	705.9309	658.6752	631.7941	643.0304	679.9131	735.6571	794.1784	838.5107 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
North		6.2800	10.6334	0.6300	0.7000	0.7700	20.4081 (74)
East		20.3000	19.6403	0.6300	0.7000	0.7700	121.8471 (76)
South		16.5500	46.7521	0.6300	0.7000	0.7700	236.4670 (78)
West		5.0200	19.6403	0.6300	0.7000	0.7700	30.1316 (80)

Solar gains	408.8539	723.5757	1049.2033	1378.0787	1599.5291	1608.4973	1542.5181	1376.8672	1164.4501	816.9095	494.9698	346.3224 (83)
Total gains	1271.3355	1580.2206	1871.8494	2143.7202	2305.4599	2267.1724	2174.3122	2019.8976	1844.3631	1552.5667	1289.1482	1184.8332 (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	20.5216	20.5726	20.6228	20.8618	20.9071	21.1208	21.1208	21.1608	21.0380	20.9071	20.8156	20.7208
alpha	2.3681	2.3715	2.3749	2.3908	2.3938	2.4081	2.4081	2.4107	2.4025	2.3938	2.3877	2.3814
util living area	0.9598	0.9340	0.8915	0.8173	0.7113	0.5761	0.4516	0.4942	0.6830	0.8601	0.9404	0.9655 (86)
MIT	18.8625	19.1378	19.5404	20.0208	20.4194	20.6942	20.8112	20.7902	20.5757	20.0324	19.3563	18.8145 (87)
Th 2	19.7991	19.8017	19.8042	19.8162	19.8185	19.8290	19.8290	19.8309	19.8249	19.8185	19.8139	19.8092 (88)
util rest of house	0.9534	0.9238	0.8744	0.7878	0.6624	0.4995	0.3485	0.3907	0.6134	0.8306	0.9294	0.9600 (89)
MIT 2	16.9585	17.3555	17.9314	18.6115	19.1484	19.4972	19.6191	19.6042	19.3657	18.6469	17.6847	16.8957 (90)
Living area fraction									fLA = Living area / (4) =			0.2172 (91)
MIT	17.3721	17.7427	18.2809	18.9177	19.4245	19.7572	19.8781	19.8618	19.6285	18.9479	18.0479	17.3125 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.2221	17.5927	18.1309	18.7677	19.2745	19.6072	19.7281	19.7118	19.4785	18.7979	17.8979	17.1625 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	0.9338	0.8983	0.8438	0.7563	0.6366	0.4834	0.3389	0.3792	0.5896	0.7981	0.9048	0.9422	(94)
Useful gains	1187.2077	1419.4609	1579.4469	1621.2788	1467.5962	1095.9509	736.9781	765.9283	1087.4648	1239.1749	1166.4153	1116.3737	(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	3319.6581	3252.6371	2973.2983	2493.6467	1909.9918	1249.8437	780.8032	825.1011	1347.8147	2067.1795	2734.7604	3298.0202	(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	1586.5431	1231.8944	1037.0254	628.1049	329.1423	0.0000	0.0000	0.0000	0.0000	616.0355	1129.2084	1623.1450	(98)
Space heating												8181.0990	(98)
Space heating per m2												43.1061	(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)													0.1000	(201)
Fraction of space heat from main system(s)													0.9000	(202)
Efficiency of main space heating system 1 (in %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													65.0000	(208)
Space heating requirement													8135.8996	(211)
Space heating requirement	1586.5431	1231.8944	1037.0254	628.1049	329.1423	0.0000	0.0000	0.0000	0.0000	616.0355	1129.2084	1623.1450	(98)	
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)	
Space heating fuel (main heating system)	1577.7777	1225.0884	1031.2960	624.6347	327.3238	0.0000	0.0000	0.0000	0.0000	612.6320	1122.9697	1614.1773	(211)	
Water heating requirement	244.0836	189.5222	159.5424	96.6315	50.6373	0.0000	0.0000	0.0000	0.0000	94.7747	173.7244	249.7146	(215)	
Water heating requirement	188.0217	143.7306	118.9220	65.5353	30.6381	13.8390	8.3346	40.5011	71.1223	123.8635	162.8838	187.1236	(64)	
Efficiency of water heater	89.1097	89.1285	89.1490	89.2567	89.3767	79.8000	79.8000	79.8000	79.8000	88.3370	88.8543	89.1428	(217)	
Fuel for water heating, kWh/month	211.0001	161.2622	133.3968	73.4234	34.2798	17.3422	10.4443	50.7533	89.1257	140.2170	183.3157	209.9145	(219)	
Water heating fuel used												1314.4750	(219)	
Annual totals kWh/year												8135.8996	(211)	
Space heating fuel - main system												1258.6306	(215)	
Space heating fuel - secondary														
Electricity for pumps and fans:														
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													568.7400	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)	
Total delivered energy for all uses												10539.1255	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	8135.8996	3.4800	283.1293	(240)
Space heating - secondary	1258.6306	4.2300	53.2401	(242)
Water heating (other fuel)	1314.4750	3.4800	45.7437	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	568.7400	13.1900	75.0168	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-863.6197	13.1900	-113.9114	(252)
Total energy cost			479.7060	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200	(256)
Energy cost factor (ECF)			0.8581	(257)
SAP value			88.0293	
SAP rating (Section 12)			88	(258)
SAP band			B	

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	8135.8996	0.2160	1757.3543 (261)
Space heating - secondary	1258.6306	0.0190	23.9140 (263)
Water heating (other fuel)	1314.4750	0.2160	283.9266 (264)
Space and water heating			2065.1949 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	568.7400	0.5190	295.1760 (268)
Energy saving/generation technologies			
PV Unit	-863.6197	0.5190	-448.2186 (269)
Total kg/year			1977.0273 (272)
CO2 emissions per m2			10.4200 (273)
EI value			88.7167
EI rating			89 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	120.9800 (1b)	x 2.6900 (2b)	= 325.4362 (1b) - (3b)
First floor	68.8100 (1c)	x 2.4900 (2c)	= 171.3369 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	189.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 496.7731 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					50.0000 / (5) = 0.1006 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3506 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3506 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.3000	3.5000	3.9000	3.7000	4.1000 (22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.8250	0.8750	0.9750	0.9250	1.0250 (22a)
Adj infilt rate												
Effective ac	0.3857	0.3682	0.3682	0.3419	0.3419	0.2981	0.3068	0.2893	0.3068	0.3419	0.3244	0.3594 (22b)
	0.5744	0.5678	0.5678	0.5584	0.5584	0.5444	0.5471	0.5418	0.5471	0.5584	0.5526	0.5646 (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
Windows (Uw = 1.40)			48.1500	1.3258	63.8352		(27)
Entrance Door			3.8800	1.4000	5.4320		(26a)
Ground Floor			120.9800	0.1100	13.3078		(28a)
EW1 - Facing Brick	226.9700	52.0300	174.9400	0.2100	36.7374		(29a)
R1 - Flat ceiling	116.2000		116.2000	0.1700	19.7540		(30)
R2 - Flat Roof (balcony)	4.2500		4.2500	0.1600	0.6800		(30)
Total net area of external elements Aum, m ²			468.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	139.7464		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7995 (36)
Total fabric heat loss						(33) + (36) =	158.5459 (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	94.1623	93.0789	93.0789	91.5483	91.5483	89.2492	89.6838	88.8271	89.6838	91.5483	90.5908	92.5561 (38)
Heat transfer coeff	252.7083	251.6248	251.6248	250.0942	250.0942	247.7951	248.2297	247.3730	248.2297	250.0942	249.1368	251.1020 (39)
Average = Sum(39)m / 12 =												249.8422 (39)
HLP	1.3315	1.3258	1.3258	1.3177	1.3177	1.3056	1.3079	1.3034	1.3079	1.3177	1.3127	1.3231 (40)
HLP (average)												1.3164 (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												2.9886 (42)
Average daily hot water use (litres/day)												105.1797 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	115.6977	111.4905	107.2833	103.0762	98.8690	94.6618	94.6618	98.8690	103.0762	107.2833	111.4905	115.6977 (44)
Energy content (annual)	171.5764	150.0618	154.8503	135.0023	129.5379	111.7814	103.5819	118.8617	120.2813	140.1762	153.0133	166.1626 (45)
Distribution loss (46)m = 0.15 x (45)m	25.7365	22.5093	23.2276	20.2503	19.4307	16.7672	15.5373	17.8293	18.0422	21.0264	22.9520	24.9244 (46)
Water storage loss:												250.0000 (47)
Store volume												1.7800 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9612 (55)
Total storage loss	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(56)
If cylinder contains dedicated solar storage	20.8580	18.8395	20.8580	20.1852	20.8580	20.1852	20.8580	20.8580	20.1852	20.8580	20.1852	20.8580	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	215.6968	189.9125	197.5750	170.9459	160.8640	141.8718	134.6754	150.8857	157.5756	182.9009	195.7105	210.2830	(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												1168.8015	(H5)
Overshading factor													0.8000 (H6)
Solar energy available												1963.5865	(H7)
Adjustment factor for showers													1.0000 (H7a)
Solar-to-load ratio													1.1865 (H8)
Utilisation factor													0.5695 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													127.5000 (H13)
Daily hot water demand													105.1797 (H14)
Volume ratio Veff/V													1.2122 (H15)
Solar storage volume factor													1.0000 (H16)
Solar input													-983.2660 (H17)
Solar input	-31.4418	-45.8912	-77.6865	-105.8373	-127.5148	-132.6716	-129.6018	-115.3458	-91.0741	-62.9955	-36.7495		-26.4561 (63)
													-983.2660 (63)
Output from w/h													
	184.2550	144.0213	119.8886	65.1086	33.3493	9.2002	5.0736	35.5399	66.5015	119.9055	158.9610	183.8269	(64)
													1125.6312 (64)
Heat gains from water heating, kWh/month													
	92.3455	81.7761	85.6675	73.6431	68.1322	61.2397	59.3158	65.1407	69.8290	80.7884	85.0347	90.5454	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173	179.3173 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.5110	71.5092	58.1552	44.0272	32.9109	27.7847	30.0224	39.0242	52.3782	66.5062	77.6226	82.7487 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	539.1575	544.7523	530.6537	500.6393	462.7516	427.1425	403.3535	397.7587	411.8574	441.8717	479.7594	515.3685 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203	55.9203 (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)	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448	-119.5448 (71)
Water heating gains (Table 5)	124.1203	121.6907	115.1445	102.2821	91.5756	85.0551	79.7255	87.5547	96.9847	108.5865	118.1037	121.7008 (72)
Total internal gains	862.4816	856.6449	822.6461	765.6414	705.9309	658.6752	631.7941	643.0304	679.9131	735.6571	794.1784	838.5107 (73)

[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	6.2800	12.7650	0.6300	0.7000	0.7700	24.4993 (74)
East	20.3000	23.8018	0.6300	0.7000	0.7700	147.6648 (76)
South	16.5500	54.2217	0.6300	0.7000	0.7700	274.2477 (78)
West	5.0200	23.8018	0.6300	0.7000	0.7700	36.5161 (80)

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	20.8618	20.9516	20.9516	21.0798	21.0798	21.2754	21.2382	21.3117	21.2382	21.0798	21.1608	20.9952
alpha	2.3908	2.3968	2.3968	2.4053	2.4053	2.4184	2.4159	2.4208	2.4159	2.4053	2.4107	2.3997
util living area	0.9514	0.9273	0.8774	0.7874	0.6668	0.4875	0.3562	0.3938	0.6246	0.8281	0.9256	0.9579 (86)
MIT	19.0358	19.2660	19.6874	20.1636	20.5298	20.7779	20.8531	20.8421	20.6607	20.1773	19.5387	18.9932 (87)
Th 2	19.8162	19.8207	19.8207	19.8270	19.8270	19.8364	19.8346	19.8382	19.8346	19.8270	19.8309	19.8228 (88)
util rest of house	0.9435	0.9159	0.8578	0.7529	0.6103	0.4015	0.2464	0.2819	0.5464	0.7919	0.9116	0.9510 (89)
MIT 2	17.2201	17.5523	18.1511	18.8142	19.2956	19.5912	19.6569	19.6536	19.4713	18.8506	17.9570	17.1636 (90)
Living area fraction												0.2172 (91)
MIT	17.6146	17.9246	18.4849	19.1074	19.5637	19.8490	19.9167	19.9118	19.7297	19.1388	18.3006	17.5611 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.4646	17.7746	18.3349	18.9574	19.4137	19.6990	19.7667	19.7618	19.5797	18.9888	18.1506	17.4111 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	0.9218	0.8895	0.8267	0.7228	0.5879	0.3905	0.2397	0.2741	0.5271	0.7598	0.8846	0.9311	(94)
Useful gains	1240.1607	1426.7572	1571.4288	1596.4524	1377.7599	938.5979	548.2237	588.0164	1031.5586	1247.5089	1212.0740	1163.7243	(95)
Ext temp.	4.9000	5.4000	7.2000	9.7000	12.6000	15.6000	17.5000	17.3000	14.7000	11.3000	7.8000	4.9000	(96)
Heat loss rate W	3175.1681	3113.7579	2801.8071	2315.2114	1704.0644	1015.7087	562.6716	608.9881	1211.2802	1922.9302	2578.7224	3141.5513	(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	1439.6455	1133.6645	915.4014	517.5065	242.7705	0.0000	0.0000	0.0000	0.0000	502.5135	983.9869	1471.5033	(98)
Space heating												7206.9921	(98)
Space heating per m2												37.9735	(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)													0.1000	(201)
Fraction of space heat from main system(s)													0.9000	(202)
Efficiency of main space heating system 1 (in %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													65.0000	(208)
Space heating requirement													7167.1745	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	1439.6455	1133.6645	915.4014	517.5065	242.7705	0.0000	0.0000	0.0000	0.0000	502.5135	983.9869	1471.5033	(98)	
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)	
Space heating fuel (main heating system)	1431.6916	1127.4012	910.3440	514.6474	241.4293	0.0000	0.0000	0.0000	0.0000	499.7371	978.5505	1463.3734	(211)	
Water heating requirement	221.4839	174.4099	140.8310	79.6164	37.3493	0.0000	0.0000	0.0000	0.0000	77.3098	151.3826	226.3851	(215)	
Water heating														
Water heating requirement	184.2550	144.0213	119.8886	65.1086	33.3493	9.2002	5.0736	35.5399	66.5015	119.9055	158.9610	183.8269	(64)	
Efficiency of water heater	89.0140	89.0235	88.9843	89.0358	88.9211	79.8000	79.8000	79.8000	79.8000	88.0265	88.6903	89.0447	(217)	
Fuel for water heating, kWh/month	206.9955	161.7790	134.7300	73.1263	37.5043	11.5291	6.3579	44.5362	83.3352	136.2152	179.2317	206.4433	(219)	
Water heating fuel used												1281.7836	(219)	
Annual totals kWh/year														
Space heating fuel - main system												7167.1745	(211)	
Space heating fuel - secondary												1108.7680	(215)	
Electricity for pumps and fans:														
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													568.7400	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 1.00 * 1169 * 1.00) =										-935.0412		-935.0412	(233)	
Total delivered energy for all uses													9316.4249	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	7167.1745	3.6300	260.1684	(240)
Space heating - secondary	1108.7680	5.1600	57.2124	(242)
Water heating (other fuel)	1281.7836	3.6300	46.5287	(247)
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	568.7400	19.4400	110.5631	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-935.0412	19.4400	-181.7720	(252)
Total energy cost			412.0006	(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	7167.1745	0.2160	1548.1097	(261)
Space heating - secondary	1108.7680	0.0190	21.0666	(263)
Water heating (other fuel)	1281.7836	0.2160	276.8653	(264)
Space and water heating			1846.0415	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	568.7400	0.5190	295.1760	(268)
Energy saving/generation technologies				
PV Unit	-935.0412	0.5190	-485.2864	(269)
Total kg/year			1720.8062	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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	7167.1745	1.2200	8743.9529 (261)
Space heating - secondary	1108.7680	1.0400	1153.1187 (263)
Water heating (other fuel)	1281.7836	1.2200	1563.7760 (264)
Space and water heating			11460.8476 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	568.7400	3.0700	1746.0317 (268)
Energy saving/generation technologies			
PV Unit	-935.0412	3.0700	-2870.5765 (269)
Primary energy kWh/year			10720.0528 (272)
Primary energy kWh/m2/year			56.4838 (273)

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	Detached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	East
Overshading	Average or unknown
Thermal mass parameter	100.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	8.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	1311.48 (P1)
Transmission heat loss coefficient	158.55 (37)
Summer heat loss coefficient	1470.03 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North	0.000	1.000	None
East	0.000	1.000	None
South	0.000	1.000	None
West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	1.000	0.90	1.000	0.900 (P8)
East	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)
West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	6.2800	81.1852	0.6300	0.7000	0.9000	182.1210
East	20.3000	117.5071	0.6300	0.7000	0.9000	852.0864
South	16.5500	112.2060	0.6300	0.7000	0.9000	663.3423
West	5.0200	117.5071	0.6300	0.7000	0.9000	210.7130

total: 1908.2627

	Jun 2013	Jul 1908	Aug 1738	
Solar gains	2013	1908	1738	(P3)
Internal gains	679	652	663	
Total summer gains	2692	2561	2400	(P5)

Summer gain/loss ratio	1.83	1.74	1.63	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 100.0)	1.30	1.30	1.30	
Threshold temperature	19.13	20.94	20.73	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			

U-VALUE CALCULATOR REPORT

Property Reference	22098 - Plot 2	Issued on Date	08/04/2022
Assessment Reference	As Designed	Prop Type Ref	Plot 2
Project	Plot 2, 71, Oak Tree Road, Reading, RG31 6LA		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	12.63	TER	15.87
Environmental	87 B	% DER<TER	20.41		
CO ₂ Emissions (t/year)	1.99	DFEE	52.55	TFEE	61.66
General Requirements Compliance	Pass	% DFEE<TFEE	14.79		

Assessor Details	Miss Sofia Kymiatzi, Sofia Kymiatzi, Tel: 07365 923 614, sofia@jostec.co.uk	Assessor ID	U123-0001
Client	The Keen Partnership, 22098		

Building Elements

Roof 000004

Roof Type: Pitched Roof, insulated sloping ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Standard cavity				
	Main construction	10	0.0667	0.1500	87.50
	Main construction	10	0.1300	0.0769	12.50
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 2	Hybris				
	Main construction	140	0.0330	4.2424	87.50
	Main construction	140	0.1300	1.0769	12.50
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Hcontrol Hybrid				
	Main construction	45	0.0237	1.9000	100.00
Layer 4	airspace/timber battens				
	Main construction	22	0.1222	0.1800	89.63
	Main construction	22	0.1375	0.1600	10.37
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 5	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

Total resistance: Upper limit = 5.983 m² K/W Lower limit = 5.514 m² K/W Average = 5.749 m² K/W
Total correction = 0.0029 m² K/W U-value (unrounded) = 0.17 W/m² K

Unheated space: None

Total thickness: 230 mm

U-value: 0.17 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	22098 - Plot 2	Issued on Date	08/04/2022
Assessment Reference	As Designed	Prop Type Ref	Plot 2
Project	Plot 2, 71, Oak Tree Road, Reading, RG31 6LA		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	12.63	TER	15.87
Environmental	87 B	% DER<TER	20.41		
CO ₂ Emissions (t/year)	1.99	DFEE	52.55	TFEE	61.66
General Requirements Compliance	Pass	% DFEE<TFEE	14.79		

Assessor Details	Miss Sofia Kymiatzi, Sofia Kymiatzi, Tel: 07365 923 614, sofia@jostec.co.uk	Assessor ID	U123-0001
Client	The Keen Partnership, 22098		

Building Elements

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Brick, outer leaf				
	Main construction	102.5	0.7700	0.1331	82.81
	Main construction	102.5	0.9407	0.1090	17.19
Layer 2	Earthwool Dritherm 32 Ultimate				
	Main construction	125	0.0320	3.9063	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Celcon Standard - Normal - Trad joint 10mm				
	Main construction	100	0.1500	0.6667	93.18
	Main construction	100	0.8803	0.1136	6.82
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
Layer 6	Plaster, standard				
	Main construction	6	0.4000	0.0150	100.00
Int surface				0.1300	

Total resistance: Upper limit = 5.074 m² K/W Lower limit = 4.950 m² K/W Average = 5.012 m² K/W
Total correction = 0.0061 m² K/W U-value (unrounded) = 0.21 W/m² K

Unheated space: None

Total thickness: 361 mm

U-value: 0.21 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	22098 - Plot 2	Issued on Date	08/04/2022
Assessment Reference	As Designed	Prop Type Ref	Plot 2
Project	Plot 2, 71, Oak Tree Road, Reading, RG31 6LA		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	12.63	TER	15.87
Environmental	87 B	% DER<TER	20.41		
CO ₂ Emissions (t/year)	1.99	DFEE	52.55	TFEE	61.66
General Requirements Compliance	Pass	% DFEE<TFEE	14.79		

Assessor Details	Miss Sofia Kymiatzi, Sofia Kymiatzi, Tel: 07365 923 614, sofia@jostec.co.uk	Assessor ID	U123-0001
Client	The Keen Partnership, 22098		

Building Elements

Floor 000007 - Floor - suspended beam-and-block floor

Floor Type: Suspended Floor

Area = 140.00 m², Perimeter = 60.10 m, Wall thickness = 300.00 mm, Soil: Clay

Depth of underfloor space below ground: 0.200 m Floor wind shielding: Average (suburban)

Floor height above ground: h = 0.000 m

U-value of walls above ground: U_w = 1.500 m

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.1700	
Layer 1	AAC (600 kg/m ³)/ concrete				
	Main construction	150	0.1800	0.8333	86.30
	Main construction	150	1.3500	0.1111	13.70
Layer 2	Celotex XR4000				
	Main construction	150	0.0220	6.8182	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Screed				
	Main construction	65	1.1500	0.0565	100.00
Int surface				0.1700	

Total resistance: Upper limit = 7.941 m² K/W Lower limit = 7.655 m² K/W Average = 7.798 m² K/W

Total correction = 0.0076 m² K/W

U-value (unrounded) = 0.11 W/m² K

Unheated space: None

Total thickness: 365 mm

U-value: 0.11 W/m² K

Kappa: n/a

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	22098 - Plot 2	Issued on Date	08/04/2022
Assessment Reference	As Designed	Prop Type Ref	Plot 2
Property	Plot 2, 71, Oak Tree Road, Reading, RG31 6LA		
SAP Rating	87 B	DER	12.63
Environmental	87 B	TER	15.87
CO ₂ Emissions (t/year)	1.99	% DER<TER	20.41
General Requirements Compliance	Pass	DFEE	52.55
		TFEE	61.66
		% DFEE<TFEE	14.79
Assessor Details	Miss Sofia Kymiatzi, Sofia Kymiatzi, Tel: 07365 923 614, sofia@jostec.co.uk		Assessor ID
Client	The Keen Partnership, 22098		

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

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)	15.87	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.63	kgCO ₂ /m ²	Pass
	-3.24 (-20.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.66	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	52.55	kWh/m ² /yr	
	-9.2 (-14.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Roof	0.17 (max. 0.20)	0.17 (max. 0.35)	Pass
Openings	1.40 (max. 2.00)	1.40 (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	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Worcester Greenstar 8000 Style GR8700iW 30 S NG Efficiency: 89.5% SEDBUK2009 Minimum: 88.0%	Pass
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BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Secondary heating system

Room heaters - Wood Logs
Closed room heater
Efficiency: 65%
Minimum: 65%

Pass

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.78 kWh/day
Permitted by DBSCG 2.56

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

6.28 m², No overhang

Windows facing East

20.30 m², No overhang

Windows facing South

16.55 m², No overhang

Windows facing West

5.02 m², No overhang

Air change rate

8.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Floor U-value

0.11

W/m²K

Secondary heating (wood logs)

N/A

Secondary heating fuel:

wood logs

Photovoltaic array

1.00

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	22098 - Plot 2	Issued on Date	08/04/2022
Assessment Reference	As Designed	Prop Type Ref	Plot 2
Property	Plot 2, 71, Oak Tree Road, Reading, RG31 6LA		
SAP Rating	87 B	DER	12.63
Environmental	87 B	TER	15.87
CO ₂ Emissions (t/year)	1.99	% DER<TER	20.41
General Requirements Compliance	Pass	DfEE	52.55
		TFEE	61.66
		% DfEE<TFEE	14.79
Assessor Details	Miss Sofia Kymiatzi, Sofia Kymiatzi, Tel: 07365 923 614, sofia@jostec.co.uk		Assessor ID
Client	The Keen Partnership, 22098		

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

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2022
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	51.59 m	120.98 m ²	2.69 m
1st Storey:	35.42 m	68.81 m ²	2.49 m

7.0 Living Area	41.23	m ²
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8.0 Thermal Mass Parameter	Simple calculation - Low	
Thermal Mass	100.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
EW1 - Facing Brick	Cavity Wall	0.21	226.97	174.94

10.0 External Roofs

Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
R1 - Flat ceiling	External Plane Roof	0.17	116.20	116.20
R2 - Flat Roof (balcony)	External Flat Roof	0.16	4.25	4.25

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid		0.11	120.98

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.40
Entrance Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.40

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Entrance Door	Half Glazed Door	[1] EW1 - Facing Brick	East							1.97	
E Windows	Window	[1] EW1 - Facing Brick	East	None	0.00					20.30	
W Windows	Window	[1] EW1 - Facing Brick	West	None	0.00					5.02	
Rear Door	Half Glazed Door	[1] EW1 - Facing Brick	West							1.91	
S Windows	Window	[1] EW1 - Facing Brick	South	None	0.00					16.55	
N Windows	Window	[1] EW1 - Facing Brick	North	None	0.00					6.28	

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)	32.22	0.050	No	catnic
Independently assessed	E3 Sill	17.55	0.034	No	CD0027
Independently assessed	E4 Jamb	58.90	0.040	No	CD0028
Independently assessed	E5 Ground floor (normal)	51.59	0.060	No	CD0022
Independently assessed	E6 Intermediate floor within a dwelling	35.42	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	38.15	0.060	No	
Table K1 - Approved	E12 Gable (insulation at ceiling level)	18.15	0.240	No	
Table K1 - Default	E15 Flat roof with parapet	6.04	0.560	No	
Independently assessed	E16 Corner (normal)	28.79	0.058	No	CD0035
Independently assessed	E17 Corner (inverted – internal area greater than external area)	8.07	-0.069	No	CD0036

Y-value 0.040 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather Windows fully open

Cross ventilation possible Yes

Night Ventilation Yes

Air change rate 8.00

Mechanical Ventilation

Mechanical Ventilation System Present No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0	0	0	0
Number of open flues	0	0	0	0
Number of intermittent fans				5
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System No

22.0 Lighting

Internal

Total number of light fittings 15

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Total number of L.E.L. fittings	15	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	Database	
Percentage of Heat	100	%
Database Ref. No.	18452	
Fuel Type	Mains gas	
Main Heating	BGB	
SAP Code	102	
In Winter	90.5	
In Summer	79.8	
Controls	CBI Time and temperature zone control	
PCDF Controls	0	
Delayed Start Stat	Yes	
Sap Code	2110	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Normal (> 45°C)	
25.0 Main Heating 2	None	
Community Heating	None	
27.0 Secondary Heating	RWM	
Secondary Heating	SAP table	
Description	Wood Logs RWM Closed room heater	
SHS efficiency	65.00	%
SAP Code	633	
HETAS Approved System	Yes	
Smoke Control Area	Unknown	
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	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

29.0 Hot Water Cylinder

Hot Water Cylinder	
Cylinder Stat	Yes
Cylinder In Heated Space	Yes
Independent Time Control	Yes
Insulation Type	Measured Loss
Cylinder Volume	250.00
Loss	1.78
Pipes insulation	Fully insulated primary pipework

L

kWh/day

31.0 Thermal Store

None

32.0 Photovoltaic Unit

One Dwelling

PV Cells kWp

1.00

Orientation

South

Elevation

30°

Overshading

None Or Little

Connected to Dwelling

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	£39	B 88	