

# Full SAP Calculation Printout

Users Ref: 7869-0001-0001159

Issued on: 29.October.2008

Prop Type Ref:

Property: 80% stove as secondary heating, 01, Example, example, example

TER: 22.13

DER: 20.11

SAP Rating: 80 C

SAP Energy Cost: £312

CO2 Emissions: 2.57 t/year

EI Rating: 80 C

Energy used: 126 kWh/m2/year

Ene1: 0

ZC: 0.00

Surveyor: 7869-0001, Matthew Carter, Tel: PE25 3ER, Fax: .

Address: Burton Lodge, Marine Avenue, Skegness, Lincolnshire

Client: 00227, Sune Nightingale, Srovesonline Limited, Capton, Dartmouth, Devon, TQ6 0JE, Tel: 0117 3026754

Software Version: EES SAP 2005.015.build.0019, March 2008 (Design System), BRE SAP Worksheet 9.81

Regs Type: SAP 2005, Regs Region: England and Wales (Part L1A 2006), Construction Type: New Build

**CALCULATION DETAILS for survey reference no '7869-0001-0001159'**

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## SAP2005 input data (DesignData) -

Regs Region: England  
Construction Type: NewBuild  
Region: MI Midlands (15.5)  
Orientation: N North  
PropType: H House, D Detached  
Storeys: 2  
Property Age: 2008  
Sheltered Sides: 2  
Sunlight Shade: Average or unknown  
Wall Perimeter: 35.00 m, 35.00 m  
Floor Area: 65.00 m2, 65.00 m2  
Living Floor Area: 20.00 m2  
Storey Height: 2.50 m, 2.50 m  
Doors  
Front door: Solid Wood, uvalue: 3.00 (T), area: 1.89 m2  
Windows  
Front windows: Double, Low E, Soft Coat, PVC, 16 mm, North (0°), uvalue: 1.70 (T)  
Side windows: Double, Low E, Soft Coat, PVC, 16 mm, East (270°), uvalue: 1.70 (T)  
Rear windows: Double, Low E, Soft Coat, PVC, 16 mm, South (180°), uvalue: 1.70 (T)  
Draught Lobby: No  
Draught Proofing: 100%  
Roof Lights  
Pressure Test: Air permeability 8.00 m<sup>3</sup>/h.m<sup>2</sup> (assumed)  
Mechanical Ventilation: None, Windows open during hot weather: Windows fully open  
Cross ventilation possible: Yes  
Fans, Chimneys, Flues: 3, 0, 1  
Lighting: Low energy lighting in 50% of fixed outlets  
Main Wall Type: U: 0.28 A: X(153.11 m2)  
Extented Wall Types:  
Timber Frame Wall Area: 0.00  
Roof Main: U: 0.16 A: 65.00 m2  
Main Floor Type: U: 0.20 A: 65.00 m2  
Timber Floor: No Timber Floor  
Thermal Mass: Simple Thermal Mass Parameter calculation:  
Ground Floor Mass: Low - suspended timber floor  
External Wall Mass: Low - timber/steel frame walls or masonry wall  
Separating Wall Mass: Low - plasterboard on timber/steel stud  
Internal Partition Mass: Low - plasterboard on timber/steel stud  
Manufacturer's data: Clients choice, Pumped: pump in heated space  
Main Heating: Manufacturer's data: Clients choice, to Clients Spec, 88.0%  
Main Heating Manufacturer: CBD Programmer, room thermostat and TRVs  
Heating Controls: Boiler interlock - Yes  
Underfloor Heating: None  
Combi Type: StandardCombi  
Combi Keep Hot: WithoutKeepHot  
Secondary Heating: Manufacturer's data: to clients choice, Tested to BS EN 13240

Manufacturer: Stoves, Efficiency: 80.0%  
Thermal Store: None  
Hot Water Heating: HWP From the primary heating system  
Hot Water Cylinder: None  
Solar Water Heating: None  
Electricity Tariff: 7 - Hour Off Peak  
PV Cells: None  
Thermal Bridges: DefaultRobustConstr, Thermal bridging factor  $\gamma = 0.08$   
Energy Saved:  
Energy Used:  
Terrain Type: Urban  
Number of Wind Turbines: 0  
Small-scale hydro generators: 0.00

## SAP calculation (Existing Dwelling as Designed)

1. Overall house dimensions			
Ground floor	65.000 * 2.500	162.50	
First floor	65.000 * 2.500	162.50	
Total floor area	130.000		(5)
Total house volume		325.00	(6)
2. Ventilation rate			
Number of chimneys	0 * 40	0	
Number of flues	1 * 20	20	
Number of fans	3 * 10	30	
Flueless gas fire	0 * 40	0	
Infiltration		0.15	(10)
Pressure test value		8.00	(q50)
Infiltration rate		0.55	(19)
Sides sheltered		2	(20)
Shelter factor		0.85	(21)
Adjusted infiltration rate		0.47	(22)
Air change natural ventilation		0.61	(24)
Effective air change rate		0.61	(25)
3. Heat losses			
Doors Front door	1.890 * 3.000	5.67	
Doors Heat Loss total		5.67	(26)
Windows Front windows	8.000 * 1/[(1/ 1.700)+0.04]	12.73	
Windows Side windows	4.000 * 1/[(1/ 1.700)+0.04]	6.37	
Windows Rear windows	8.000 * 1/[(1/ 1.700)+0.04]	12.73	
Windows Heat Loss total		31.84	(27)
Roof Lights Heat Loss total		0.00	(27)
Ground floor 1	65.000 * 0.200	13.00	
Ground floor Heat Loss total		13.00	(28)
Main External wall type	153.110 * 0.280	42.87	(29)
Secondary walls Loss total		0.00	(29a)
Roof Main	65.000 * 0.160	10.40	(30)
Roof Loss total		10.40	(30)
Total area of elements		305.00	(32)
Fabric heat loss		103.78	(33)
Appendix K: Thermal bridging		0.08	(y)
Effect of thermal bridges		24.40	(34)
Total fabric heat loss		128.18	(35)
Ventilation heat loss		65.51	(36)
Heat loss coefficient		193.69	(37)
Heat loss parameter (HLP)		1.49	(38)
4. Water heating energy requirements			
Energy of heated water		2459.98	(39)
Distribution loss		434.11	(40)
Hot Water storage loss factor		0.0000	(44)
Volume factor		0.000	(44a)
Temperature factor T		1.00	(44b)
Energy lost from tank		0.00	(45)
Energy lost from tank		0.00	(46)
If cyl contains solar storage		0.00	(47)
Primary circuit loss		0.00	(48)

Combi loss from Table 3a		600.00	(49)
Output from water heater		3494.09	(51)
Gains from water heating		1112.29	(52)
<b>5. Internal gains</b>			
Lighting, appliances, cooking and metabolic (Table 5)		714.84	(53)
Reduction of internal gains due to LE lighting (Appendix L)			
Correction factor for low-energy outlets		0.75	(C1)
Window 1	0.9 * 8.000 * 0.80 * 0.7 * 0.83 / 130.000	0.03	
Window 2	0.9 * 4.000 * 0.80 * 0.7 * 0.83 / 130.000	0.01	
Window 3	0.9 * 8.000 * 0.80 * 0.7 * 0.83 / 130.000	0.03	
Ratio of glass area to floor area		0.06	(GL)
Correction factor for daylighting		1.01	(C2)
Annual energy used for lighting in the house		915.36	(EL)
Reduction in lighting use due to low energy lights		305.12	(deltaEL)
Low energy lighting		-45.77	(53a)
Central heating pump		10.00	(53b)
Water heating		126.97	(54)
Total internal gains		806.04	(55)
<b>6. Solar gains</b>			
	Access Area Flux g FF Gains		
	Factor (m2)	(W)	
Windows 'N '	0.770 * 8.000 * 29.000 * 0.9 * 0.630 * 0.7	70.90	(56)
Windows1 'E '	0.770 * 4.000 * 48.000 * 0.9 * 0.630 * 0.7	58.68	(58)
Windows2 'S '	0.770 * 8.000 * 72.000 * 0.9 * 0.630 * 0.7	176.03	(60)
Total solar gains		305.61	(65)
Total gains, W		1111.66	(66)
Gains/loss ratio (GLR)		5.74	(67)
Utilisation factor		0.957	(68)
Useful gains, W		1063.36	(69)
<b>7. Mean internal temperature</b>			
Mean internal temperature of living zone (heating type = 1)		18.88	(70)
Temperature adjustment		0.00	(71)
Adjustment for gains		0.30	(72)
Adjusted room temperature		19.18	(73)
Temperature difference between zones		1.49	(74)
Living area fraction		0.154	(75)
Rest of house floor fraction		0.846	(76)
Mean internal temperature		17.92	(77)
<b>8. Degree days</b>			
Temperature raise from gains		5.49	(78)
Base temperature		12.43	(79)
Degree days		1434.99	(80)
<b>9a. Energy requirements - individual heating systems, including micro-CHP</b>			
Space heating requirement (useful)		6670.47	(81)
Fraction of heat from secondary system		0.10	(82)
Model name : Clients choice			
Manufacturer: to Clients Spec			
MHS efficiency		88.0	
Main system efficiency		88.0	(83)
Test Method : BS EN 13240			
Model name : to clients choice			
Manufacturer: Stoves			
Secondary system efficiency		80.0	(84)
Space heating fuel - main HS		6822.07	(85)
Space heating fuel - secondary HS		833.81	(85a)
Efficiency of water heater		88.00	(86)
Energy required for water heating		3494.09	
Energy used for water heating		3970.56	(86a)
For each central heating pump		130.00	(87a)
For each boiler with F.A.F		45.00	(87b)

Electricity for pumps, fans, ...		175.00	(87)
Electricity for lighting (50% fixed LEL)		915.36	(87g)
10a. Fuel costs - individual heating systems			
MHS heating cost	[ 6822.07 * 1.6300 * 0.01]	111.20	(88)
SHS heating cost	[ 833.81 * 2.2000 * 0.01]	18.34	(89)
Water heating cost	[ 3970.56 * 1.6300 * 0.01]	64.72	(91)
Pump/fan energy	[ 175.00 * 7.6500 * 0.01]	13.39	(92)
Lighting energy	[ 915.36 * 7.6500 * 0.01]	70.02	(93)
Additional standing charges		34.00	(94)
Total energy cost		311.68	(97)
Total energy cost using Sedbuk db prices		468.00	
11. SAP rating			
Energy cost deflator		0.91	(98)
Energy cost factor		1.45	(99)
ECF unrounded = 1.44928717626673			
SAP value		79.77	
SAP value unrounded = 79.7679510193164			
SAP Energy rating		80	(100)
SAP Energy rating band		C	
12a. Carbon dioxide emissions			
MHS heating CO2	[ 6822.07 * 0.1940]	1323.48	(101)
SHS heating CO2	[ 833.81 * 0.0250]	20.85	(102)
WHS heating CO2	[ 3970.56 * 0.1940]	770.29	(103)
Space and water heating CO2		2114.61	(107)
Pumps and fans CO2	[ 175.00 * 0.4220]	73.85	(108)
Lighting CO2	[ 915.36 * 0.4220]	386.28	(109)
Total CO2 emissions in kg/year		2574.75	(112)
Dwelling's Carbon Factor		14.71	(CF)
Environmental Impact Rating		80.28	
Environmental Impact Rating rounded		80	
Environmental Impact Rating band		C	
13a. Primary energy			
MHS heating P.E.	[ 6822.07 * 1.1500]	7845.38	
SHS heating P.E.	[ 833.81 * 1.1000]	917.19	
WHS heating P.E.	[ 3970.56 * 1.1500]	4566.14	
Space and water heating P.E.		13328.71	
Pumps and fans P.E.	[ 175.00 * 2.8000]	490.00	(104)
Lighting P.E.	[ 915.36 * 2.8000]	2563.01	(104a)
Primary energy kWh/year		16381.72	
Primary energy kWh/m2/year		126.01	(105)

## DER calculation (Existing Dwelling as Designed)

1. Overall house dimensions			
Ground floor	65.000 * 2.500	162.50	
First floor	65.000 * 2.500	162.50	
Total floor area	130.000		(5)
Total house volume		325.00	(6)
2. Ventilation rate			
Number of chimneys	0 * 40	0	
Number of flues	1 * 20	20	
Number of fans	3 * 10	30	
Flueless gas fire	0 * 40	0	
Infiltration		0.15	(10)
Pressure test value		8.00	(q50)
Infiltration rate		0.55	(19)
Sides sheltered		2	(20)
Shelter factor		0.85	(21)
Adjusted infiltration rate		0.47	(22)
Air change natural ventilation		0.61	(24)
Effective air change rate		0.61	(25)
3. Heat losses			
Doors Front door	1.890 * 3.000	5.67	
Doors Heat Loss total		5.67	(26)
Windows Front windows	8.000 * 1/[(1/ 1.700)+0.04]	12.73	
Windows Side windows	4.000 * 1/[(1/ 1.700)+0.04]	6.37	
Windows Rear windows	8.000 * 1/[(1/ 1.700)+0.04]	12.73	
Windows Heat Loss total		31.84	(27)
Roof Lights Heat Loss total		0.00	(27)
Ground floor 1	65.000 * 0.200	13.00	
Ground floor Heat Loss total		13.00	(28)
Main External wall type	153.110 * 0.280	42.87	(29)
Secondary walls Loss total		0.00	(29a)
Roof Main	65.000 * 0.160	10.40	(30)
Roof Loss total		10.40	(30)
Total area of elements		305.00	(32)
Fabric heat loss		103.78	(33)
Appendix K: Thermal bridging		0.08	(y)
Effect of thermal bridges		24.40	(34)
Total fabric heat loss		128.18	(35)
Ventilation heat loss		65.51	(36)
Heat loss coefficient		193.69	(37)
Heat loss parameter (HLP)		1.49	(38)
4. Water heating energy requirements			
Energy of heated water		2459.98	(39)
Distribution loss		434.11	(40)
Hot Water storage loss factor		0.0000	(44)
Volume factor		0.000	(44a)
Temperature factor T		1.00	(44b)
Energy lost from tank		0.00	(45)
Energy lost from tank		0.00	(46)
If cyl contains solar storage		0.00	(47)
Primary circuit loss		0.00	(48)

Combi loss from Table 3a		600.00	(49)
Output from water heater		3494.09	(51)
Gains from water heating		1112.29	(52)
5. Internal gains			
Lighting, appliances, cooking and metabolic (Table 5)		714.84	(53)
Reduction of internal gains due to LE lighting (Appendix L)			
Correction factor for low-energy outlets		0.85	(C1)
Window 1	0.9 * 8.000 * 0.80 * 0.7 * 0.83 / 130.000	0.03	
Window 2	0.9 * 4.000 * 0.80 * 0.7 * 0.83 / 130.000	0.01	
Window 3	0.9 * 8.000 * 0.80 * 0.7 * 0.83 / 130.000	0.03	
Ratio of glass area to floor area		0.06	(GL)
Correction factor for daylighting		1.01	(C2)
Annual energy used for lighting in the house		1037.41	(EL)
Reduction in lighting use due to low energy lights		183.07	(deltaEL)
Low energy lighting		-27.46	(53a)
Central heating pump		10.00	(53b)
Water heating		126.97	(54)
Total internal gains		824.35	(55)
6. Solar gains			
	Access	Area	Flux
	Factor	(m2)	g
			FF
			Gains
			(W)
Windows 'N '	0.770 *	8.000 *	29.000 * 0.9 * 0.630 * 0.7
			70.90
Windows1 'E '	0.770 *	4.000 *	48.000 * 0.9 * 0.630 * 0.7
			58.68
Windows2 'S '	0.770 *	8.000 *	72.000 * 0.9 * 0.630 * 0.7
			176.03
Total solar gains			305.61
Total gains, W			1129.96
Gains/loss ratio (GLR)			5.83
Utilisation factor			0.954
Useful gains, W			1078.31
7. Mean internal temperature			
Mean internal temperature of living zone (heating type = 1)		18.88	(70)
Temperature adjustment		0.00	(71)
Adjustment for gains		0.31	(72)
Adjusted room temperature		19.19	(73)
Temperature difference between zones		1.49	(74)
Living area fraction		0.154	(75)
Rest of house floor fraction		0.846	(76)
Mean internal temperature		17.93	(77)
8. Degree days			
Temperature raise from gains		5.57	(78)
Base temperature		12.37	(79)
Degree days		1422.02	(80)
9a. Energy requirements - individual heating systems, including micro-CHP			
Space heating requirement (useful)		6610.18	(81)
Fraction of heat from secondary system		0.10	(82)
Model name : Clients choice			
Manufacturer: to Clients Spec			
MHS efficiency		88.0	
Main system efficiency		88.0	(83)
Test Method : BS EN 13240			
Model name : to clients choice			
Manufacturer: Stoves			
Secondary system efficiency		80.0	(84)
Space heating fuel - main HS		6760.41	(85)
Space heating fuel - secondary HS		826.27	(85a)
Efficiency of water heater		88.00	(86)
Energy required for water heating		3494.09	
Energy used for water heating		3970.56	(86a)
For each central heating pump		130.00	(87a)
For each boiler with F.A.F		45.00	(87b)

Electricity for pumps, fans, ...		175.00	(87)
Electricity for lighting (30% fixed LEL)		1037.41	(87g)
10a. Fuel costs - individual heating systems			
MHS heating cost	[ 6760.41 * 1.6300 * 0.01]	110.19	(88)
SHS heating cost	[ 826.27 * 2.2000 * 0.01]	18.18	(89)
Water heating cost	[ 3970.56 * 1.6300 * 0.01]	64.72	(91)
Pump/fan energy	[ 175.00 * 7.6500 * 0.01]	13.39	(92)
Lighting energy	[ 1037.41 * 7.6500 * 0.01]	79.36	(93)
Additional standing charges		34.00	(94)
Total energy cost		319.84	(97)
Total energy cost using Sedbuk db prices		479.12	
12a. Carbon dioxide emissions			
MHS heating CO2	[ 6760.41 * 0.1940]	1311.52	(101)
SHS heating CO2	[ 826.27 * 0.0250]	20.66	(102)
WHS heating CO2	[ 3970.56 * 0.1940]	770.29	(103)
Space and water heating CO2		2102.46	(107)
Pumps and fans CO2	[ 175.00 * 0.4220]	73.85	(108)
Lighting CO2	[ 1037.41 * 0.4220]	437.79	(109)
Total CO2 emissions in kg/year		2614.10	(112)
Dwelling's Carbon Emission Rate (DER) - orientation: N		20.11	(113)
Dwelling's Carbon Factor		14.94	(CF)
Environmental Impact Rating		79.98	
Environmental Impact Rating rounded		80	
Environmental Impact Rating band		C	



TER calculation (Existing Dwelling as Designed)

1. Overall house dimensions			
Ground floor	65.000 * 2.500	162.50	
First floor	65.000 * 2.500	162.50	
Total floor area	130.000		(5)
Total house volume		325.00	(6)
2. Ventilation rate			
Number of chimneys	0 * 40	0	
Number of flues	0 * 20	0	
Number of fans	3 * 10	30	
Flueless gas fire	0 * 40	0	
Infiltration		0.09	(10)
Pressure test value		10.00	(q50)
Infiltration rate		0.59	(19)
Sides sheltered		2	(20)
Shelter factor		0.85	(21)
Adjusted infiltration rate		0.50	(22)
Air change natural ventilation		0.63	(24)
Effective air change rate		0.63	(25)
3. Heat losses			
Doors One opaque door	1.850 * 2.000	3.70	
Doors Heat Loss total		3.70	(26)
Windows Double glazed, low-E	30.650 * 1/[(1/ 2.000)+0.04]	56.76	
Windows Heat Loss total		56.76	(27)
Roof Lights Heat Loss total		0.00	(27)
Ground floor 1	65.000 * 0.250	16.25	
Ground floor Heat Loss total		16.25	(28)
Main External wall type	142.500 * 0.350	49.88	(29)
Secondary walls Loss total		0.00	(29a)
Roof Main	65.000 * 0.160	10.40	(30)
Roof Loss total		10.40	(30)
Total area of elements		305.00	(32)
Fabric heat loss		136.98	(33)
Appendix K: Thermal bridging		0.11	(y)
Effect of thermal bridges		33.55	(34)
Total fabric heat loss		170.53	(35)
Ventilation heat loss		67.22	(36)
Heat loss coefficient		237.75	(37)
Heat loss parameter (HLP)		1.83	(38)
4. Water heating energy requirements			
Energy of heated water		2459.98	(39)
Distribution loss		434.11	(40)
Tank volume		150.00	(43)
Hot Water storage loss factor		0.0191	(44)
Volume factor		0.928	(44a)
Temperature factor T		0.54	(44b)
Energy lost from tank		524.28	(45)
Energy lost from tank		524.28	(46)
If cyl contains solar storage		524.28	(47)
Primary circuit loss		610.00	(48)
Output from water heater		4028.38	(51)

Gains from water heating		1869.71	(52)
5. Internal gains			
Lighting, appliances, cooking and metabolic (Table 5)		714.84	(53)
Reduction of internal gains due to LE lighting (Appendix L)			
Correction factor for low-energy outlets		0.85	(C1)
Window 1	$0.9 * 30.650 * 0.80 * 0.7 * 0.83 / 130.000$	0.10	
Ratio of glass area to floor area		0.10	(GL)
Correction factor for daylighting		0.96	(C2)
Annual energy used for lighting in the house		986.54	(EL)
Reduction in lighting use due to low energy lights		174.10	(deltaEL)
Low energy lighting		-26.11	(53a)
Central heating pump		10.00	(53b)
Water heating		213.44	(54)
Total internal gains		912.16	(55)
6. Solar gains			
	Access Factor	Area (m2)	Flux g
			FF
Windows 'E '	$0.770$	$30.650$	$48.000 * 0.9 * 0.720$
			$* 0.7$
Gains (W)			513.85
Total solar gains			513.85
Total gains, W			1426.01
Gains/loss ratio (GLR)			6.00
Utilisation factor			0.950
Useful gains, W			1355.09
7. Mean internal temperature			
Mean internal temperature of living zone (heating type = 1)		18.86	(70)
Temperature adjustment		0.00	(71)
Adjustment for gains		0.34	(72)
Adjusted room temperature		19.20	(73)
Temperature difference between zones		1.54	(74)
Living area fraction		0.154	(75)
Rest of house floor fraction		0.846	(76)
Mean internal temperature		17.89	(77)
8. Degree days			
Temperature raise from gains		5.70	(78)
Base temperature		12.20	(79)
Degree days		1386.01	(80)
9a. Energy requirements - individual heating systems, including micro-CHP			
Space heating requirement (useful)		7908.65	(81)
Fraction of heat from secondary system		0.10	(82)
Model name : Clients choice			
Manufacturer: to Clients Spec			
MHS efficiency		78.0	
Main system efficiency		78.0	(83)
Secondary system efficiency		100.0	(84)
Space heating fuel - main HS		9125.37	(85)
Space heating fuel - secondary HS		790.87	(85a)
Efficiency of water heater		78.00	(86)
Energy required for water heating		4028.38	
Energy used for water heating		5164.58	(86a)
For each central heating pump		130.00	(87a)
For each boiler with F.A.F		45.00	(87b)
Electricity for pumps, fans, ...		175.00	(87)
Electricity for lighting (30% fixed LEL)		986.54	(87g)
12a. Carbon dioxide emissions			
MHS heating CO2	[ $9125.37 * 0.1940$ ]	1770.32	(101)
SHS heating CO2	[ $790.87 * 0.4220$ ]	333.75	(102)
WHS heating CO2	[ $5164.58 * 0.1940$ ]	1001.93	(103)
Space and water heating CO2		3106.00	(107)

Pumps and fans CO2	[ 175.00 * 0.4220]	73.85	(108)
Lighting CO2	[ 986.54 * 0.4220]	416.32	(109)
Total CO2 emissions in kg/year		3596.17	(112)
Dwelling's Carbon Factor		20.55	(CF)
Environmental Impact Rating		72.46	
Environmental Impact Rating rounded		72	
Environmental Impact Rating band		C	
CO2 for heating and hot water		3179.85	(CH)
CO2 emissions from internal lighting		416.32	(CL)
ADL1A - Table 1 Fuel factor		1.00	(FuelFactor)
Level of reduction in CO2 - Improvement factor		20	(%)
Total floor area		130.00	(TFA)
Target Carbon Dioxide Emission Rate		22.13	(TER)

**Regulation compliance checklist**

1 TER and DER				OK
1.1 Target Carbon Dioxide Emission Rate				
Main fuel - Gas, Fuel factor = 1.00, TER = 22.13				
1.2 Dwelling Carbon Dioxide Emission Rate - DER = 20.11				
1.3 DER 20.11 < TER 22.13				
2.1 Fabric U-values				OK
Wall	0.28 (0.35)	0.28 (0.70)	OK	
Roof	0.16 (0.25)	0.16 (0.35)	OK	
Floor	0.20 (0.25)	0.20 (0.70)	OK	
Openings	1.81 (2.20)	3.00 (3.30)	OK	
2.3 Heating efficiency				OK
Manufacturer's data: Clients choice, Pumped: pump in heated space				
Efficiency - Manufacturer data: 88.0%				
Minimum permitted: 86.0% - OK				
Secondary heating: Manufacturer's data: to clients choice, Tested to BS EN 13240				
Manufacturer: Stoves, Efficiency: 80.0%				
Minimum permitted: 65.0% - OK				
2.4 Cylinder insulation				OK
No cylinder				
2.5 Controls				OK
Programmer, room thermostat and TRVs - OK				
2.7 Low energy lighting				OK
Light fittings: 20, L.E.L. fittings: 10 = 50.00% > 25% - OK				
L.E.L. fittings required per 25m2 or part of TFA: 6 < 10 - OK				
2.8 External lighting				OK
External lights: None				
3.1 Summertime temperature				OK
Region: Midlands (15.5)				
Thermal mass parameter = 5.0				
Ventilation rate in hot weather = 8.0				
Overheating risk (Orientation 'N') = Not significant - OK				
4.1 Key features				
Openings U-value 1.70 < 1.80				
4.5 Design air permeability				OK
Design air permeability = 8.0				
Overall result:				OK

**Recommendation Level E**

E Low energy lighting : 100%  
Recommendation result : Recommended  
E Recommendation no : 101  
E Recommendation text : Low energy lighting for all fixed outlets  
CO2 emissions : 2477.618  
Total energy cost (\_97) : 291.383  
SAP rating : 81 ( 81.241)  
E Recommendation : SAP change (81.241 - 79.768), increase = 1.473

**Recommendation Level N**

N Solar Panel : installed  
Recommendation result : Recommended  
N Recommendation no : 102  
N Recommendation text : Solar water heating  
CO2 emissions : 2292.939  
Total energy cost (\_97) : 278.944  
SAP rating : 82 ( 82.144)  
N Recommendation : SAP change (82.144 - 81.241), increase = 0.903  
EffectTooSmall

**Recommendation Level U**

U Photovoltaics : 2.5 kWp  
Recommendation result : Recommended  
U Recommendation no : 103  
U Recommendation text : Solar photovoltaic panels, 2.5 kWp  
CO2 emissions : 1345.969  
Total energy cost (\_97) : 167.658  
SAP rating : 90 ( 90.222)  
U Recommendation : SAP change (90.222 - 81.241), increase = 8.981

**Recommendation Level**

V Wind turbine : blade diameter 1.75 m  
Recommendation result : Recommended  
V Recommendation no : 104  
V Recommendation text : Wind turbine  
CO2 emissions : 1319.210  
Total energy cost (\_97) : 164.330  
SAP rating : 90 ( 90.464)  
V Recommendation : SAP change (90.464 - 90.222), increase = 0.242  
EffectTooSmall



**Recommendation Total**

E Low energy lighting	:	100%
U Photovoltaics	:	2.5 kWp
Recommendation result	:	Recommended
U Recommendation no	:	103
U Recommendation text	:	Solar photovoltaic panels, 2.5 kWp
CO2 emissions	:	1530.648
Total energy cost (_97)	:	180.097
SAP rating	:	89 ( 89.320)