

Full SAP Calculation Printout

Users Ref: 7869-0001-0001158

Issued on: 29.October.2008

Prop Type Ref:

Property: Standard, 01, Example, example, example

TER: 22.13

DER: 22.10

SAP Rating: 80 C

SAP Energy Cost: £306

CO2 Emissions: 2.70 t/year

EI Rating: 79 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 '7869-0001-0001158'

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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 m³/h.m² (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)
Extended 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: None

Manufacturer:
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)
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		0.75	(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)
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
			(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)
7. Mean internal temperature			
Mean internal temperature of living zone (heating type = 1)		18.88	(70)
Temperature adjustment		0.00	(71)
Adjustment for gains		0.30	(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)
8. Degree days			
Temperature raise from gains		5.49	(78)
Base temperature		12.43	(79)
Degree days		1434.99	(80)
9a. Energy requirements - individual heating systems, including micro-CHP			
Space heating requirement (useful)		6670.47	(81)
Model name : Clients choice			
Manufacturer: to Clients Spec			
MHS efficiency		88.0	
Main system efficiency		88.0	(83)
Secondary system efficiency		0.0	(84)
Space heating fuel - main HS		7580.08	(85)
Space heating fuel - secondary HS		0.00	(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	[7580.08 * 1.6300 * 0.01]	123.56	(88)
SHS heating cost	[0.00 * 0.0000 * 0.01]	0.00	(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		305.69	(97)
Total energy cost using Sedbuk db prices		463.59	
11. SAP rating			
Energy cost deflator		0.91	(98)
Energy cost factor		1.42	(99)
ECF unrounded = 1.41814822533168			
SAP value		80.20	
SAP value unrounded = 80.2026507743697			
SAP Energy rating		80	(100)
SAP Energy rating band		C	
12a. Carbon dioxide emissions			
MHS heating CO2	[7580.08 * 0.1940]	1470.53	(101)
WHS heating CO2	[3970.56 * 0.1940]	770.29	(103)
Space and water heating CO2		2240.82	(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		2700.95	(112)
Dwelling's Carbon Factor		15.43	(CF)
Environmental Impact Rating		79.32	
Environmental Impact Rating rounded		79	
Environmental Impact Rating band		C	
13a. Primary energy			
MHS heating P.E.	[7580.08 * 1.1500]	8717.09	
WHS heating P.E.	[3970.56 * 1.1500]	4566.14	
Space and water heating P.E.		13283.23	
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		16336.24	
Primary energy kWh/m2/year		125.66	(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)
Secondary system efficiency		100.0	(84)
Space heating fuel - main HS		6760.41	(85)
Space heating fuel - secondary HS		661.02	(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	[661.02 * 7.6500 * 0.01]	50.57	(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		352.23	(97)
Total energy cost using Sedbuk db prices		526.07	

12a. Carbon dioxide emissions

MHS heating CO2	[6760.41 * 0.1940]	1311.52	(101)
SHS heating CO2	[661.02 * 0.4220]	278.95	(102)
WHS heating CO2	[3970.56 * 0.1940]	770.29	(103)
Space and water heating CO2		2360.76	(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		2872.39	(112)
Dwelling's Carbon Emission Rate (DER) - orientation: N		22.10	(113)
Dwelling's Carbon Factor		16.41	(CF)
Environmental Impact Rating		78.01	
Environmental Impact Rating rounded		78	
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)
Windows 'E '			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 = 22.10	
1.3 DER 22.10 < 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: None	
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 : 2606.796
Total energy cost (_97) : 285.253
SAP rating : 82 (81.686)
E Recommendation : SAP change (81.686 - 80.203), increase = 1.483

Recommendation Level N

N Solar Panel : installed
Recommendation result : Recommended
N Recommendation no : 102
N Recommendation text : Solar water heating
CO2 emissions : 2422.116
Total energy cost (_97) : 272.815
SAP rating : 83 (82.589)
N Recommendation : SAP change (82.589 - 81.686), 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 : 1475.147
Total energy cost (_97) : 161.529
SAP rating : 91 (90.667)
U Recommendation : SAP change (90.667 - 81.686), 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 : 1448.387
Total energy cost (_97) : 158.201
SAP rating : 91 (90.909)
V Recommendation : SAP change (90.909 - 90.667), 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	: 1659.826
Total energy cost (_97)	: 173.968
SAP rating	: 90 (89.764)