

# Energy Certification in the UK

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RIBA

Lisboa e-nova conference

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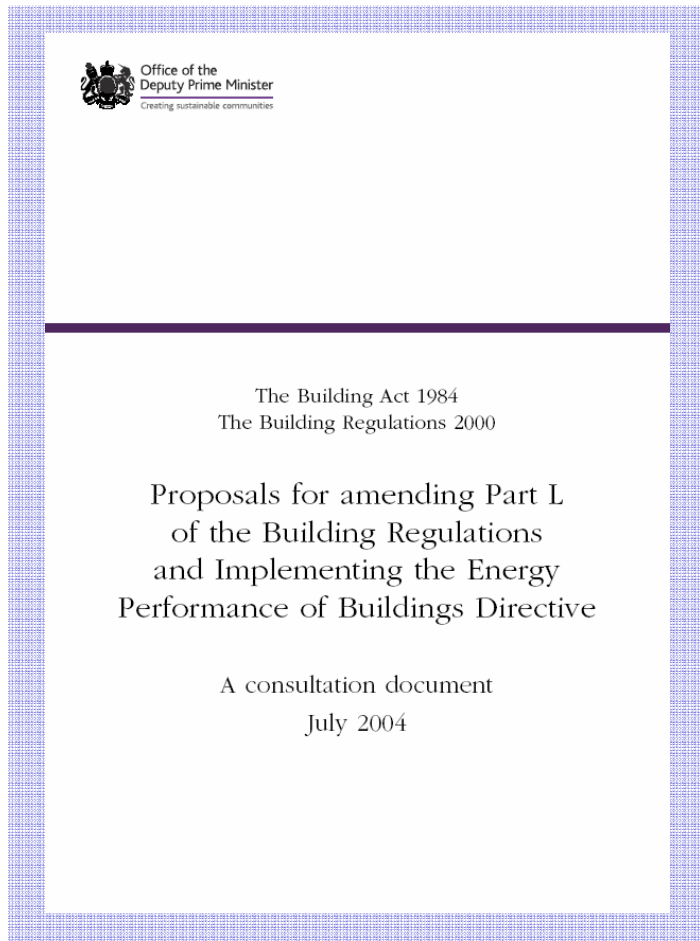
# Energy Performance Directive: Implementation in the UK

Office of the Deputy Prime Minister responsible

Directive Implementation Action Group (DIAG) review

Regulations still not finalised – delayed to April 2006.

# Implementation in the UK: regulations under development

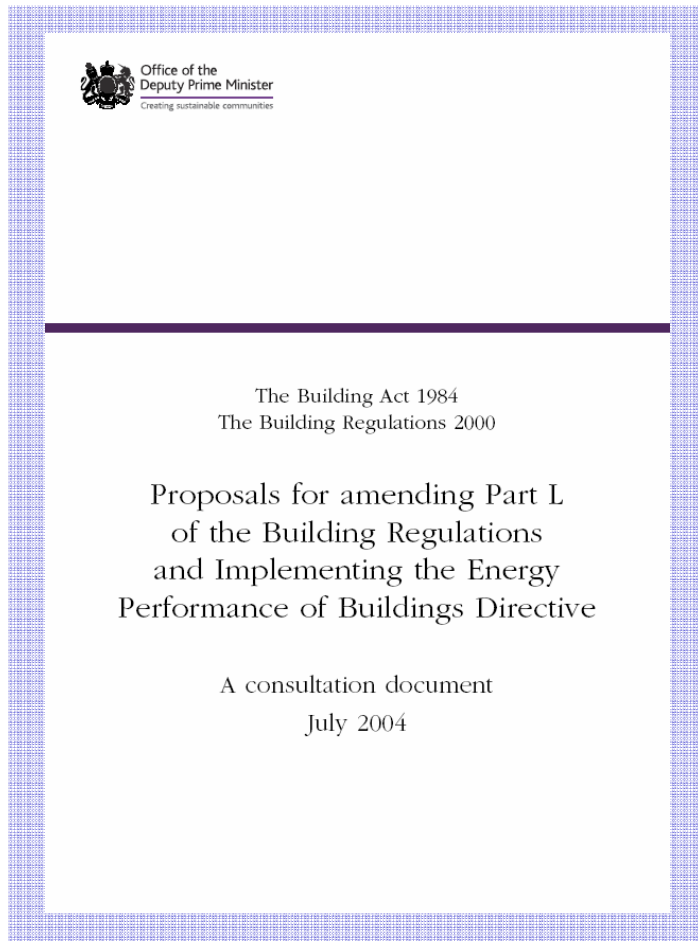


Coordinates Building Regulations with requirements of EPBD

25% improvement – Domestic

28% improvement – Non Domestic.

# Implications for new building design



Design to a performance standard rather than deemed to satisfy construction standard

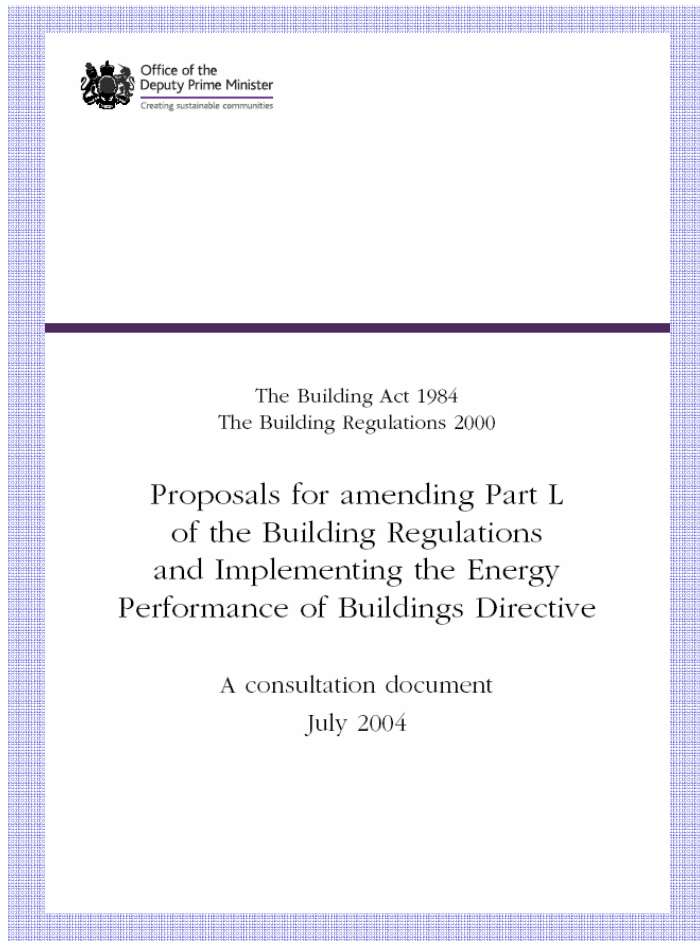
Carbon calculation is sole method for compliance

Domestic: SAP 2005

Non Domestic: Simple: iSBEM based on NEN 29

Complex: Approved commercial software.

# Implications for new building design



Air tightness testing to become a standard procedure

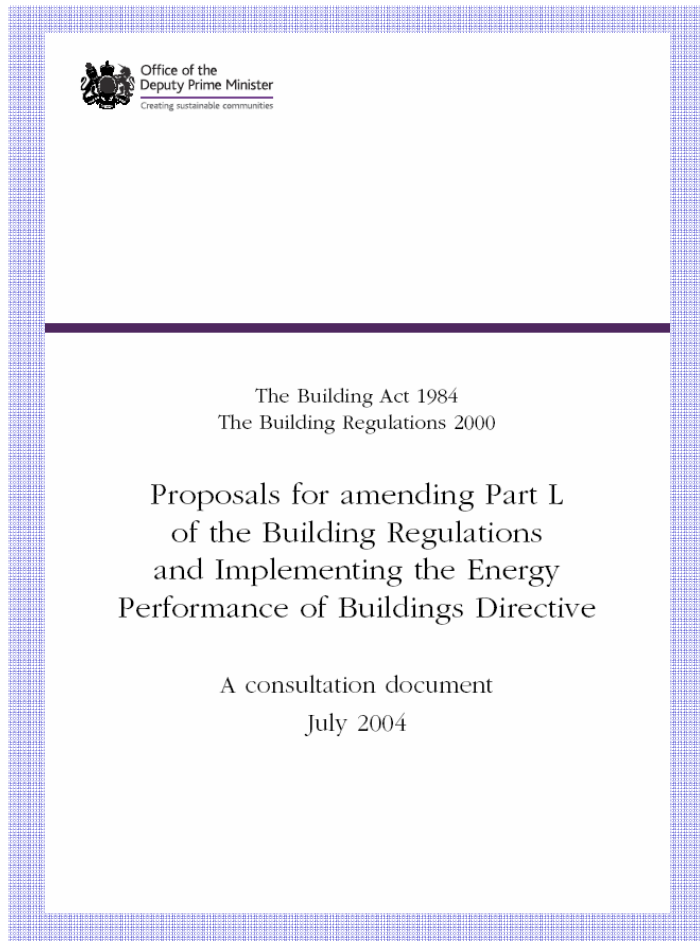
Overheating assessed

Existing buildings – cost effective works required

Commissioning certificates required

Operational manual required.

# Implications for new building design - concerns



iSBEM calculation software still under development

Apparently complex process

Architects ideally placed to coordinate a whole building approach

At what level of complexity is the involvement of an engineer essential?

## Domestic Sector: New Homes SAP 2005

Standard Assessment Procedure using BRE approved software

Energy cost rating and Dwelling CO<sub>2</sub> Emission Rate (DER) (kg CO<sub>2</sub>/m<sup>2</sup>/yr)

Scale: 0 (worst) – 100 (zero energy cost)

Standard use pattern

No regional variations

Includes:

- Thermal insulation including thermal bridging
- Ventilation characteristics and equipment
- Heating controls
- Solar gains through windows
- Fuel type
- Renewable energy sources.

## Domestic Sector: Existing homes RDSAP

Reduced data SAP (RDSAP)

Same scale as new homes

Inference engine software

Incorporated in “Home Information Pack.”



## Domestic Sector: Home Information Pack

Legal Title, fixtures & fittings, boundaries, planning and building regulations etc..

Home Condition Report:

Number and type of rooms, gross area

Health and Safety Risks

Condition of Interior, Exterior and External Features

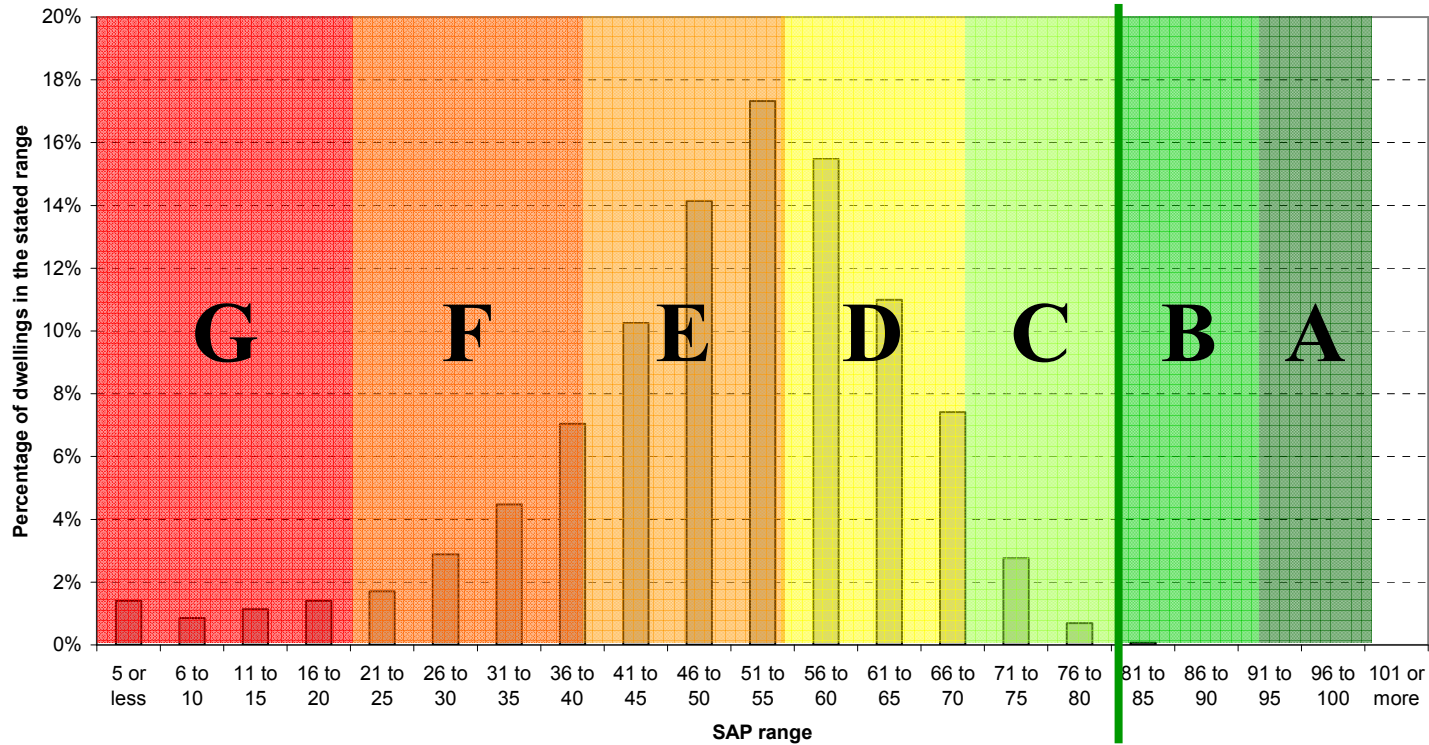
Condition of Services

Energy Performance Certificate

All for €255-385...

# Domestic Sector: Banding

Distribution of SAP 2005 ratings in the English housing stock  
(2001 English House Condition Survey data adjusted to SAP 2005)



2006 New build.

# Domestic Sector: Energy Performance Certificate

### Section H: Energy Performance Certificate

Save money, improve comfort and help the environment

The following report is based on a survey carried out by a Home Inspector for:

Address:  
100 Any Street,  
Any Town,  
Anywhere, AB1 CD2

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Address:  
100 Any Street,  
Any Town,  
Anywhere, AB1 CD2

Certificate Survey Number: XXXX  
Name of Surveyor: XXXX  
Date of Survey: XXXX

#### SUMMARY OF THIS HOME'S ENERGY PERFORMANCE

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#### ENERGY RATING AND TYPICAL RUNNING COSTS OF THIS HOME

Electricity: £ xxx per year  
Gas: £ xxx per year  
Other fuels: £ xxx per year  
Carbon dioxide emissions (CO<sub>2</sub>): xx tonnes per year

Carbon dioxide indicator: THIS HOME (at 6) vs NEW BUILD (at 8)

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Carbon dioxide indicator: THIS HOME (at 6) vs NEW BUILD (at 8)

#### SUMMARY OF THIS HOME'S ENERGY PERFORMANCE RELATED FEATURES

Building Energy Performance	Current rating	Potential rating	Average new build rating
Building Type: Full Home			
Very energy efficient - lower running costs			
(100-120) <b>A</b>			95
(85-99) <b>B</b>			
(70-84) <b>C</b>		80	
(55-69) <b>D</b>	55		
(40-54) <b>E</b>			
(25-39) <b>F</b>			
(1-24) <b>G</b>			
Not energy efficient - higher running costs			
Main Walls	C	B	A
Main Roof	B	B	A
Extension Walls	N/A	N/A	N/A
Extension Roof	N/A	N/A	N/A
Main Floor	F	F	C
Extension Floor	N/A	N/A	N/A
Windows	E	D	B
Main Heating	D	B	A
Secondary Heating	G	G	D
Hot Water	D	B	B

**GB 2004**

# Domestic Sector: Draft Certificate

## Section H: Energy Performance Certificate Save money, improve comfort and help the environment

The following report is based on an inspection carried out for:

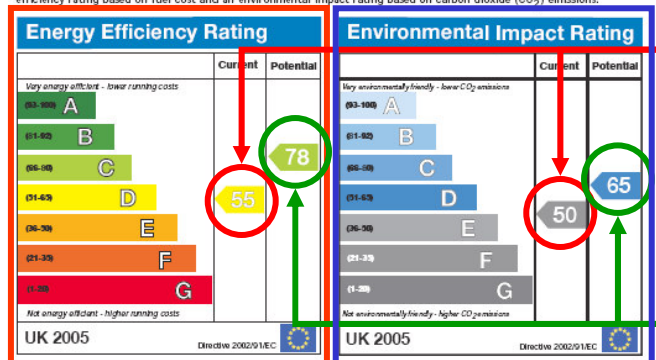
Address: 100 Any Street, Any Town, Anywhere, AB1 CD2	Building type: Whole or part of building: Assessment method: Date of inspection:	Home Whole SAP XXXXX	Certificate number: Date issued: Name of inspector:	XXXXX XXXXX XXXXX
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Basics- date, address etc

### This home's performance ratings

This home has been inspected and its performance rated in terms of its energy efficiency and environmental impact. This is calculated using the UK Standard Assessment Procedure (SAP) for dwellings which gives you an energy efficiency rating based on fuel cost and an environmental impact rating based on carbon dioxide (CO<sub>2</sub>) emissions.

SAP rating



CO<sub>2</sub>/m<sup>2</sup>/yr

Current ratings

Potential ratings

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 will be.

The environmental impact rating is a measure of this home's impact on the environment. The higher the rating the less impact it has on the environment.

Costs- heating, lighting, hot water

### Typical fuel costs and carbon dioxide (CO<sub>2</sub>) emissions of this home

This table provides you with an indication of how much it will cost to provide lighting, heating and hot water to this home. The fuel costs and carbon dioxide emissions are calculated based on a SAP assessment of the actual energy use that would be needed to deliver the defined level of comfort in this home, using standard occupancy assumptions, which are described on page 4. The energy use includes the energy used in producing and delivering the fuels to this home. The fuel costs only take into account the cost of fuel and not any associated service, maintenance or safety inspection costs. The costs have been provided for guidance only as it is unlikely they will match actual costs for any particular household.

Current

	Current	Potential
Energy use	xxx kWh/m <sup>2</sup> /year	xxx kWh/m <sup>2</sup> /year
Carbon dioxide emissions	xxx tonnes per year	xxx tonnes per year
Lighting	£xxx per year	£xxx per year
Heating	£xxx per year	£xxx per year
Hot water	£xxx per year	£xxx per year

Potential.

To see how this home's performance ratings can be improved please go to page 2

# Domestic Sector: Potential improvements, costs and benefits

Certificate number: XXXXX  
 Date issued: XXXXX  
 Name of inspector: XXXXX

**Section H: Energy Performance Certificate**

**Summary of this home's energy performance related features**

The table shows the current performance of each element of this home on the following scale:  
 Extremely poor/ Very poor/ Poor/ Average/ Good/ Very good/ Excellent

Element	Description	Current performance
Main walls	Uninsulated cavity wall	Poor
Main roof	Pitched, 100mm loft insulation	Average
Main floor	Uninsulated solid concrete (assumed)	Average
Windows	Single glazed throughout	Extremely poor
Main heating	Mains gas back boiler	Poor
Main heating controls	No controls	Extremely poor
Secondary heating	Flame effect fire	Extremely poor
Hot water	From main heating system; uninsulated cylinder	Extremely poor
Lighting	Low energy lighting throughout	Excellent
<b>Current energy efficiency rating</b>		<b>D 55</b>
<b>Current environmental impact rating</b>		<b>E 50</b>

**Measures to improve this home's performance ratings**

The improved performance ratings are cumulative, that is they assume the improvements have been installed in the order that they appear in the table.

Lower cost measures	Typical savings	Performance ratings after improvement	
		Energy efficiency	Environmental impact
Cavity wall insulation	Exc per year	D 65	D 56
Loft insulation top up to 250mm	Exc per year	C 68	D 57
Hot water tank and pipe work insulation	Exc per year	C 69	D 58
Sub Total Exc per year			
<b>Higher cost measures</b>			
Condensing boiler	Exc per year	C 75	D 63
Installation of a full heating controls package	Exc per year	C 78	D 65
Sub Total Exc per year			
<b>Potential energy efficiency rating</b>		<b>C 78</b>	
<b>Potential environmental impact rating</b>		<b>D 65</b>	
<b>Further measures to achieve even higher standards</b>			
Double glazing	Exc per year	C 80	C 67
Solar water heating	Exc per year	B 85	C 72
<b>Enhanced energy efficiency rating</b>		<b>B 85</b>	
<b>Enhanced environmental impact rating</b>		<b>C 72</b>	

Existing building elements

Improvements + costs & payback

Cumulative effect

Further measures & effects.

Improvements to the energy efficiency and environmental impact ratings will usually be in step with each other. However, they can sometimes diverge because reduced energy costs are very occasionally not accompanied by reduced carbon dioxide emissions.

For further information on how to take action and to find out about grants for making your home more energy efficient freephone 0800 512 012. Or alternatively visit [www.est.org.uk/myhome](http://www.est.org.uk/myhome)

# Domestic Sector: Potential improvements, costs and benefits

Certificate number:	XXXX
Date issued:	XXXX
Name of inspector:	XXXX

Section H: Energy Performance Certificate

## Measures to improve this home's performance ratings

### Lower cost measures (typically up to £500 each)

These measures are relatively inexpensive to install and are worth tackling first.

#### Measure 1

##### Cavity wall

The external walls of your home are built with a gap, called a cavity, between the inside and outside layers of the wall. Cavity wall insulation fills this gap with an insulating material. The material is pumped into the gap through small holes, which are drilled into the outside layer of the walls (the small holes are sealed up afterwards). Because this involves using specialist machinery, a professional installation company must carry out the work. The contractor will thoroughly survey your walls before commencing work to be sure that this type of insulation is right for your home, and provide a guarantee for the work.

#### Measure 2

##### Topping up loft insulation

The anticipated cost is based upon a contractor installing an additional 100mm of glass fibre or mineral wool insulation in your loft, but it can also be installed by a capable DIY enthusiast. If you choose a DIY installation then take care not to block ventilation at the edge of the loft space as this may cause condensation. When handling the insulation always wear gloves and a mask.

#### Measure 3

##### Hot water and pipe insulation

Improving the insulation of your hot water tank using a very thick jacket will help reduce your heating bills. You should also insulate the hot water pipe connections to the cylinder, for about a metre, or as far as you can get access to them. Fit the jacket over the top of any existing jacket and over any thermostat clamped to the cylinder.

### Higher cost measures (typically up to £3000 each)

#### Measure 4

##### Condensing boiler

This improvement is most appropriate when your existing central heating boiler needs repair or replacement. A condensing boiler is capable of much higher efficiencies than other types of boiler, meaning it will burn less fuel to heat your property. Only a qualified heating engineer should carry out the installation. [Building Regulations apply to this work, so you should get advice from your local Building Control Authority].

#### Measure 5

##### Installation of full controls package

Although your heating system already has a room thermostat, you can save more money by adding thermostatic radiator valves as well. They allow you to control the temperature of each room to suit your needs, adding to comfort and reducing your bills as well. They allow you to control the temperature of each room to suit your needs, adding to comfort and reducing your bills. For example, you can set them to be warmer in your living room and bathroom than in your bedrooms. You will need a plumber to fit them to every radiator except one - the radiator in the same room as your room thermostat. You still need the room thermostat, because without it, even when the TRVs have turned off the radiators, the boiler is still burning fuel and wasting your money - so don't let the plumber remove it.

### Further measures to achieve an even higher standard

These measures should be considered if aiming for the highest possible standard for this home.

#### Measure 6

##### Double glazing

Replacing the existing single glazed windows with double-glazing will improve your comfort in your home by reducing draughts and cold spots near windows. This will also help to save on your heating bills during the long winter months. Building Regulations apply to this work, so you should either use a contractor who is registered with Fensa or get advice from your local Building Control Authority.

#### Measure 7

##### Solar water heating

Energy from the sun can be harnessed to provide domestic hot water. These systems do not generally provide space heating, and are described as "Solar Thermal" systems. They are among the most cost effective renewable energy systems that can be installed on dwellings in urban or rural environments.

For further information on how to take action and to find out about grants for making your home more energy efficient freephone 0800 512 012. Or alternatively visit [www.est.org.uk/myhome](http://www.est.org.uk/myhome)

Basis for establishing works required when altering or extending:

If alterations  $>$  £8,000 (€11,500)

If payback is  $<$  7 years

If extra cost is  $<$  10%.

# Domestic Sector: Energy Performance Certificate

Certificate number: XXXX  
Date issued: XXXX  
Name of inspector: XXXX

Section H: Energy Performance Certificate

## About this energy inspection

Energy inspections are not new. They have been available in the UK since the late 1990s. This inspection has been undertaken by a qualified inspector who has received appropriate training to collect the correct information about the energy efficiency of homes. This information has been processed by a Government approved organisation to produce the performance ratings and improvements in the report. Both the inspector and the energy performance certificate supplier are regularly monitored to show that their work is up to standard.

For clarification of the technical information in this energy performance certificate please contact the:

Inspector \_\_\_\_\_ on \_\_\_\_\_

Inspector registration number \_\_\_\_\_

## About this home's performance ratings

The ratings provide you with a measure of the overall energy efficiency of this home and its environmental impact. Both are calculated using the Standard Assessment Procedure (SAP), which is the Government's recommended system of assessing the energy efficiency of dwellings. The ratings take into account the home's insulation, heating systems, hot water system, fixed lighting, ventilation, number of windows and related fuels.

Not all of us use our homes in the same way so to allow one home to be directly compared to another, energy ratings are calculated using 'standard occupancy' assumptions. Standard occupancy assumes that the house is heated for 9 hours a day during weekdays and 16 hours a day at weekends, with the living room heated to 21°C and the rest of the house at 18°C.

The ratings are expressed on a scale of 1 to 100. The higher the energy efficiency rating the more energy efficient the home and the higher the environmental impact rating the less impact it has on the environment.

Homes which are more energy efficient use less energy, saving money and helping to protect the environment. A home with an energy efficiency rating of 100 would be energy self sufficient and so the cost of providing lighting, heating and hot water would be practically zero.

The potential rating shown on page one is the economic potential of the home assuming all cost effective measures have been installed. A home built to the 2005 Building Regulations would typically be at the boundary of bands B and C.

## This home's impact on the environment

Carbon dioxide is one of the biggest contributors to the man-made greenhouse effect. The energy we use to heat, light and power our homes produces 27 per cent of the UK's carbon dioxide emissions.

The average household in the UK creates about six tonnes of carbon dioxide every year, enough to fill six hot air balloons ten meters in diameter. There are simple steps you can take to cut carbon dioxide emissions and help prevent climate change. Making your home more energy efficient by adopting the suggestions in this report can help protect the environment by saving carbon dioxide. You could save even more carbon dioxide by switching to renewable energy sources.

## What can I do today?

In addition to the specific measures suggested in this report, don't forget there are many simple measures you can put into action today that will save you money and help reduce your impact on the environment.

For example:

- Check that your heating system thermostat is not set too high (21°C in the living room is suggested)
- Make sure your hot water is not too hot (60°C is suggested)
- Turn off your lights and domestic appliances when not needed, and do not leave TVs and videos on standby
- Do not overfill kettles and saucepans, and use a lid where possible
- Buy energy saving recommended appliances
- Find out if you are eligible for grants or offers to help with the cost of energy saving measures by visiting

For further information on how to take action and to find out about grants for making your home more energy efficient freephone 0800 512 012. Or alternatively visit [www.est.org.uk/myhome](http://www.est.org.uk/myhome)

Background to energy rating

Explanation of SAP system

“Standard” operation

Cost effective potential

Comparison with new-build

Energy saving and environment

Zero cost action.

## Domestic Sector: Opportunities for architects

Designed for estate agents and mortgage surveyors –  
training not onerous – but not yet defined...

Not attractive in terms of fees and architectural interest

But key information for guiding any alteration –  
particularly when buying or selling

Advantages in being able to offer updated certificate on  
completion.



# Domestic Sector: Widening the scope of Building Regulations

Addition of water and waste efficiency suggested by Sustainable Buildings Task Group in April 2004

Law has been widened to allow wider sustainability issues to be added (Sustainable and Secure Buildings Act 2004)

Code for Sustainable Building under development

Initially for housing only

Likely to include water and waste efficiency

Test bed for future regulation.

## Non-domestic sector – new buildings

### Design rating

Based on analysis of proposed building construction and services

Downloadable iSBEM (interface for Simplified Building Energy Method) from BRE

Approved commercial software

### Converted to Asset rating on completion

Based on analysis of as built building construction and services

Including air tightness test result.

## Non-domestic sector – iSBEM summary

Approved assessors

Compares energy consumption of building with a “notional building”

Same geometry, orientation and usage

Standard operating patterns

Building fabric and services that just comply with Regulations.

## Non-domestic sector – iSBEM summary – information inputs

Tabular input – non graphic

Geometry, areas, orientation

Built in weather data

Define activity zones

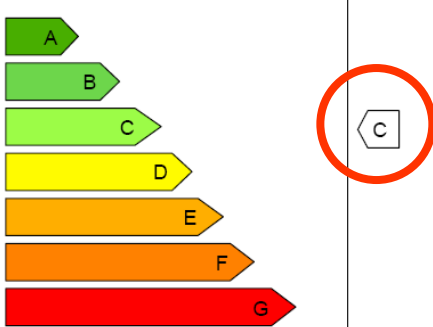
Occupancy profiles for each zone

Building envelope construction

HVAC systems

Lighting.

# Non-domestic sector – new buildings (CEN Standard certificate)

Energy certificate	Building Energy Performance	As built
	Space to make reference to the certification scheme used	Asset rating
	Very energy efficient	
	A	
	B	
	C	
D		
E		
F		
G	Not energy efficient	
Name of the indicator used	Unit	calculated
		130
Space to include additional information on building energy use		

Asset rating.


Administrative information:  
 address of the building.  
 conditioned area  
 date of validity  
 certifier name and signature...

## Non-domestic sector – Certificate Display in Public Buildings

UK interpretation of “Public Building”:

Public sector buildings regularly visited by members of the public, e.g. public libraries, sports centres, schools, universities and hospitals.

# Non-domestic sector – Public buildings

Energy Certificate	<b>Building Energy Performance &gt;</b>		<b>As built</b>		<b>In use:</b>		
	Certificate type:	FULL	<b>Asset Rating</b>	<b>Operational Rating</b>			
	Building Type:	Office					
	Whole or part of building:	Whole building					
	Very energy efficient						
	A				B		
	B				C		
	C				D		
	D				E		
	E				F		
F				G			
G				Not energy efficient			
Asset rating method:			UK National Standard 2004			Predicted	
Operational rating method:			UK Office Tailored Benchmarks 2004			Actual	
Energy use:			kg CO <sub>2</sub> per sq m of net area per annum			<b>62</b>	
Occupancy level:			Square metres net lettable area per person			<b>12</b>	
Equipment load gain level:			Watts per square metre net			<b>10</b>	
Weekly occupancy hours:			Hours per week			<b>80</b>	
Heating performance rating:			ABCDEFG			ABCDEFG	
HVAC performance rating (cooling, fans and pumps):			ABCDEFG			ABCDEFG	
Lighting performance rating:			ABCDEFG			ABCDEFG	
Management rating (for in-use performance only):			ABCDEFG			ABCDEFG	
Internal Environmental Quality:			Risk level			Not assessed	
Further information can be found in the Energy Log Book.						Not assessed	
<b>GB 2004</b>							
							
Certifying organisation:		Building name: xxxxxx		CERTIFICATE REF NO: xxxxxx			
Signed by PO Sign:		Organisation: xxxxx					
City:		Street: xxxxxxxxxxxxxx					
Postcode:		City: xxxxxxxx					
Country:		Postcode: xxx xxx					
Tel:		Contact Name: xxxxxx					
Email:		Tel: xxxxxxxxxx					
Certificate Ref No:		Email: xxxxxxxxxxxx		Date of issue: xx-xx-xxxx			

Asset rating

Calculation using “inference engine” or Part L software

Tailored benchmarks

Operational rating

Measured energy consumption

Tailored benchmarks.

## Operational ratings – advantages

More relevant to building users

Cheaper to produce

Can be updated every year.



## Operational ratings – Europrosper project

Office buildings only

International collaboration

Building experience of on PROBE Studies ([www.usablebuildings.co.uk](http://www.usablebuildings.co.uk))

Limited dataset to produce a basic energy/ carbon consumption

Further information to allow comparison with Typical & Good Practice benchmarks.

## Public Buildings – EPLabel



2 year project coordinated by ESD (Energy for Sustainable Development)

19 countries participating



Extends Europrosper work to cover:

Public administration offices

Higher education (Universities, Colleges)

Schools

Sports facilities

Hospitals and other health facilities

Hotels and restaurants.



## Public Buildings – EPLabel



Collect quality data and calculate an Energy Performance Indicator

Identify appropriate benchmarks

Grade the energy efficiency by comparison with benchmarks

Identify cost effective energy saving measures

Produce an energy certificate

1<sup>st</sup> page for public display.



# Voluntary Energy and Carbon Declaration

An initiative by The Edge ([www.at-the-edge.org.uk](http://www.at-the-edge.org.uk) )

Simple energy and carbon measurement for:

Awards

Magazines

CSR reporting and voluntary display

Support by Carbon Trust and Pilkington Energy Efficiency Trust

Testing on RIBA Sustainability Award and RIBA Sustainable Architecture Book.



RIBA

Bill Gething: **Feilden Clegg Bradley** Architects LLP

September 2005