



# **The Advances from the Energy Performance of Buildings Directive (EPBD) and Future Perspectives**

**What has come out of it?  
What can we expect in the future?**

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Eduardo Maldonado  
Univ. of Porto - Portugal  
Coordinator - Buildings Concerted Action

# OBJECTIVES

## Objectives

- Promoting the improvement of energy performance of buildings within the EU through cost-effective measures, with no compromise to comfort and Indoor air quality.
- Convergence of building standards towards those of Member States which already have ambitious levels.

## The measures

- Apply a Methodology for integrated building energy performance standards based on common minimum requirements
- Application of these standards on new and existing buildings
- Certification schemes for all buildings
- Inspection & assessment of boilers/heating and cooling installations



## THE EPBD ALREADY HAS A LONG HISTORY...

- First proposed by the EU commission in early 2001
- It became a top priority for the Belgium EU presidency, discussed in detail by the council July-Nov. 2001
- Approved unanimously by the council in December 2001
- Approved by the European Parliament on 10 October 2002, after conciliation, and by the EU Commission on 16 December 2002
- Publication in the EU official journal as Directive 2002/91/EC on 4 January 2003
- Deadline for transposition by EU MS: 4 January 2006
- **Wishful thinking though!** Half of the 25 EU MS have yet to fully transpose the EPBD, and implementation, in practice, is postponed up to 2009 almost everywhere.

## The measures

### Latest count of transpositions (out of 25):

- Apply a Methodology for integrated building energy performance standards based on common minimum requirements **21**
- Application of these standards on new and existing buildings **13**
- Certification schemes for all buildings **12**
- Inspection & assessment of boilers/heating and cooling installations **12 / 7**



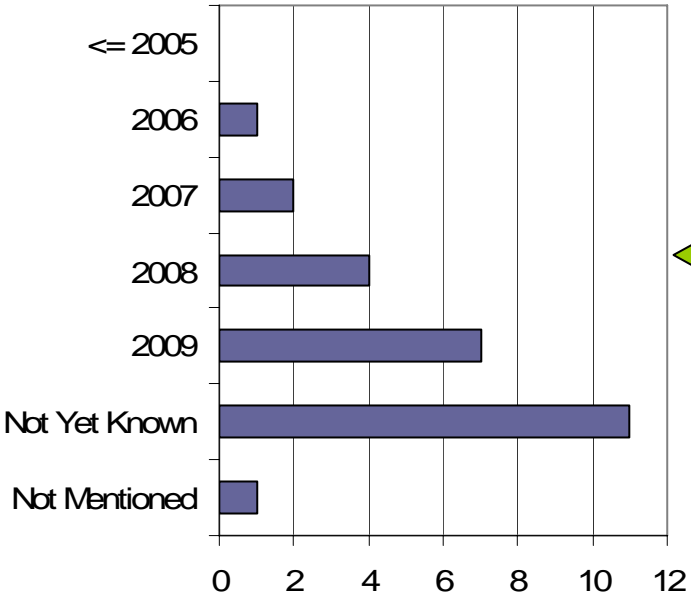
**It is obvious that there are major delays in the implementation of the EPBD in almost every MS, especially for certain topics**

**Timing for starting:  
Issue Certificates for Residential Buildings**



	By:	2006	2007	2008	2009	Undecided
New		5	8	6	3	5
		19%	48%	70%	81%	
Exist.		5	3	4	8	7
		19%	30%	44%	74%	

Art.8 - AC- Start



**Timing for starting:  
Inspections of AC systems**

**Existing buildings and inspections of boilers and AC systems are clear problems.**

## Why so many long delays?

- The EPBD approved, and rightly so, as a prime example of the subsidiarity principle (buildings and markets are widely different throughout Europe).
- The EPBD states the goals that must be reached, but it lets MS a wide range of freedom to implement them.
- The measures that must be implemented involve added costs for the population (certificates, inspections, ...) and there is always a lot of discussion about measures that impose new responsibilities upon citizens.
- The technical options are also quite wide, and there is often a lack of consensus within the technical community about the best option to adopt in each case.
- Some of the measures (e.g., inspection of boilers and AC equipment), in certain cases (e.g., small units in countries with low needs), have questionable cost-effectiveness.



# ENERGY CERTIFICATES



**Energy certificate**

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

# Certification schemes for all buildings

## Why?

- To facilitate the transfer of clear and reliable information on the energy performance of buildings.
- To make energy efficiency more attractive.

## How?

Energy performance **certificates** for new and existing buildings should be available **when they are constructed, sold or rented out**

The certificates should:

- not be more than 10 years old
- be accompanied with advice on how to improve the energy performance
- be displayed in large public buildings and institutions (over 1000m<sup>2</sup>).



# There are many variations in the form of the Certificates....

**СЕРТИФИКАТ**  
**CERTIFICATE FOR ENERGY PERFORMANCES OF A BUILDING**

Category: \_\_\_\_\_  
 No: \_\_\_\_\_ Valid till: \_\_\_\_\_  
 Building: \_\_\_\_\_

**ENERGIEAUSWEIS** für Wohngebäude  
 (gemäß § 14f Energieeinsparverordnung)

Gebäude: \_\_\_\_\_  
 Adresse: \_\_\_\_\_  
 Eigentümer: \_\_\_\_\_  
 Datum: \_\_\_\_\_  
 Energieeffizienzklasse: \_\_\_\_\_

**ENERGIEAUSWEIS** für Wohngebäude  
 (gemäß § 14f Energieeinsparverordnung)

Erklärungen: \_\_\_\_\_

**CERTIFICADO DE DESEMPENHO ENERGÉTICO E DA QUALIDADE DO AR INTERIOR**

TIPO DE EDIFÍCIO: EDIFÍCIO HABITACIONAL UNIFAMILIAR / FRACÇÃO AUTÓNOMA DE EDIF. MULTIFAMILIAR

Localidade: \_\_\_\_\_  
 Data de emissão do certificado: \_\_\_\_\_  
 Nome do portador qualif.: \_\_\_\_\_  
 Número do porto qualif.: \_\_\_\_\_

**ETIQUETA DE DESEMPENHO ENERGÉTICO**

Indicadores de desempenho: \_\_\_\_\_  
 Classe energética: **C**

Photo of the Building!

consumption

STANDARD

**ENERGIEAUSWEIS** für Wohngebäude  
 (gemäß § 14f Energieeinsparverordnung)

Berechneter Energiebedarf des Gebäudes: \_\_\_\_\_  
 Energiebedarf: \_\_\_\_\_

Nachweis der Einhaltung des § 13 oder § 14a, 1 oder 14b (Vergleichswert): \_\_\_\_\_

Erklärungen zum Berechnungsverfahren: \_\_\_\_\_

**ENERGIEAUSWEIS** für Wohngebäude  
 (gemäß § 14f Energieeinsparverordnung)

Gemessener Energieverbrauch des Gebäudes: \_\_\_\_\_  
 Energieverbrauchswert: \_\_\_\_\_

Vergleichswert Energieverbrauch: \_\_\_\_\_

Erklärungen zum Verfahren: \_\_\_\_\_

**WZE = 0,55**

**Section H Energy Performance Certificate**

10 Mountain Ash Avenue, Leighton-Sao, Essex SS9 4SY, United Kingdom

Dwelling type: Detached Bungalow  
 Home Inspector's name: John Brown  
 Date of inspection: 9 June 2006  
 Date of making the report: 8 June 2006  
 Certificate number: 13024  
 Floor area: 64 sq metres

**The home's performance ratings**

This home has been assessed using the UK's Standard Assessment Procedure (SAP) for dwellings. Its performance is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on Carbon Dioxide (CO<sub>2</sub>) emissions.

Energy Efficiency Rating		Environmental (CO <sub>2</sub> ) Impact Rating	
Current	Potential	Current	Potential
A	A	B	B
B	B	C	C
C	C	D	D
D	D	E	E
E	E	F	F
F	F	G	G
G	G	G	G

UK 2005  
 Current: 55, Potential: 78  
 Current: 65, Potential: 50

**Estimated energy use, Carbon Dioxide (CO<sub>2</sub>) emissions and fuel costs of this home**

This table provides 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 energy use. The energy use includes the energy used in producing and delivering the fuel 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 certificate allows one home to be compared with another, but always be aware that the certificate was issued. Since fuel prices can increase overtime, an older certificate may underestimate the property's fuel cost.

**DZIVOJAMAS MAJAS ERGOPASE**

Reģistrācijas numurs: AIA 00001

skina 90, Daugavpils

Ķīas tips: Daugavpils apkaimē, 467. sīkņa Apdzīvotājamais SA "Dzīvokļi" kopdzīvokļu ēkā, "Puhveidnie" Ķīas kopdzīvokļu ēkā, 79022. Ķīas apdzīvotais plāns nr. 3733. Šķēdēja ukstiņš. 72 kv. metri (43 pļāvzonā). Energoatbilstības vērtējuma datums: 23.03.2006

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WZE = 0,25 → A  
 0,25 < WZE ≤ 0,50 → B  
 0,50 < WZE ≤ 0,75 → C  
 0,75 < WZE ≤ 1,00 → D  
 1,00 < WZE ≤ 1,25 → E  
 1,25 < WZE ≤ 1,50 → F  
 WZE > 1,50 → G

**Energy labelling**

Energy labelling of the follow  
 Address: Storgade 27 A og B  
 Postal code/city: 9990 Storstadn  
 BBR no.: 12345-1  
 Energy labelling no.: 122780  
 Valid 5 years from: 8 august 2006  
 Energy consultant: Jens Pedersen

The energy labelling informs about the building savings, the break-down of the building's energy consumption. The energy labelling is prepared by required by law.

**Reported energy consumption for heat and duties:** 293.000 DKkWh

**Consumption:** 526 MWh/year

**Reported for the period:** January 1st 2005 – December 31st 2005

The reported energy consumption and costs are climate corrected by the energy consultant. Thus, the figures express an average year temperature-wise.

**Cost-effective savings**

Here are the energy consultant's proposals to reduce the energy and water consumption in the building. There may be more proposals on the next page. The proposals below are elaborated in the building inspection section.


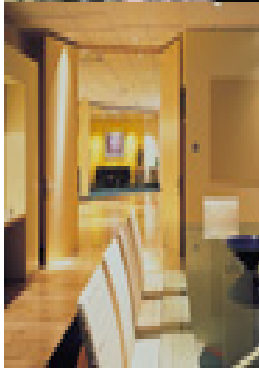
But, despite the differences, we can all "read" the same type of message in any of the certificates...

9

## Types of Ratings in Certificates

- **Asset Rating** – compares buildings on the basis of reference conditions – **best suited for New Buildings and Residential buildings.**
- **Operational Rating** – describes the actual performance of a building – accounts for use pattern, occupant effects – can use metered energy (bills) – **it should be used only for Existing Public buildings.**
- Existing buildings pose the greatest problems, because of lack of accurate information about its envelope and systems details... The new revised **EN-ISO 13790** describes the survey and calculation methodologies.

# The New Rules for Certification of Buildings

- 
- 
- ◆ When buildings are constructed, sold or rented out an **energy performance certificate** is to be made available to the buyer or tenant (**but: by building, by apartment, measured or calculated rating,...?**)
  - ◆ **Public Buildings** to set an **example** by being certified regularly and visibly (**but: what is a public building?**)
  - ◆ All large buildings visited regularly by the public to **display energy certificate prominently** (**but: what is a building regularly visited by the public?**)

**It is relatively easy to publish new building regulations. But starting a brand new certification scheme for millions of buildings is difficult and it involves a huge logistic problem.**

# Politics at work...

E.g., a Public building:

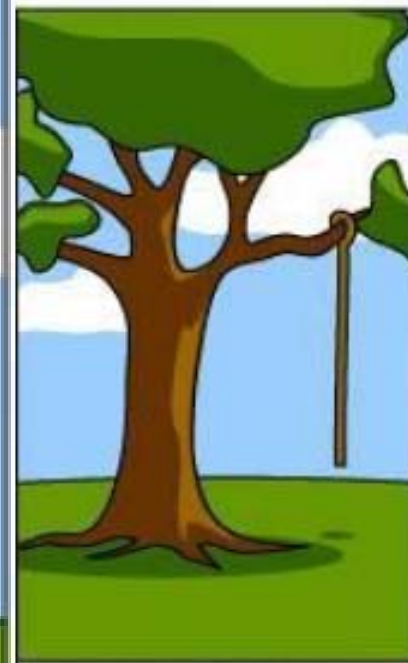
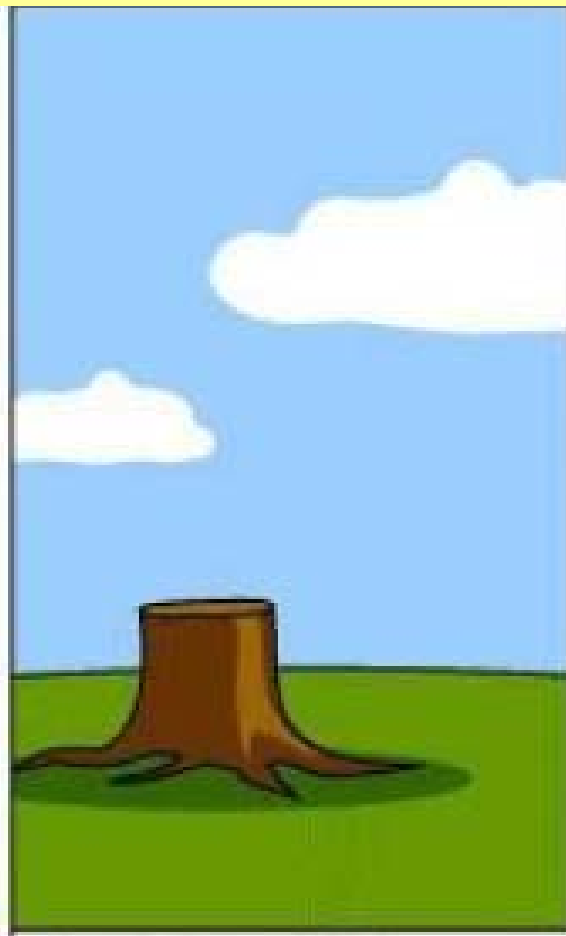
Hopefully, not the final solution...



For the EU  
Commission



For many EU  
Member States



The final way it  
is implemented  
in a few  
countries

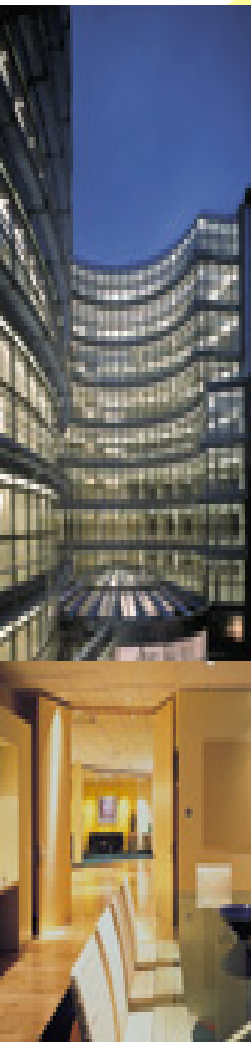
## Methodology for the integrated energy performance of buildings

### A common methodology for integrated minimum standards

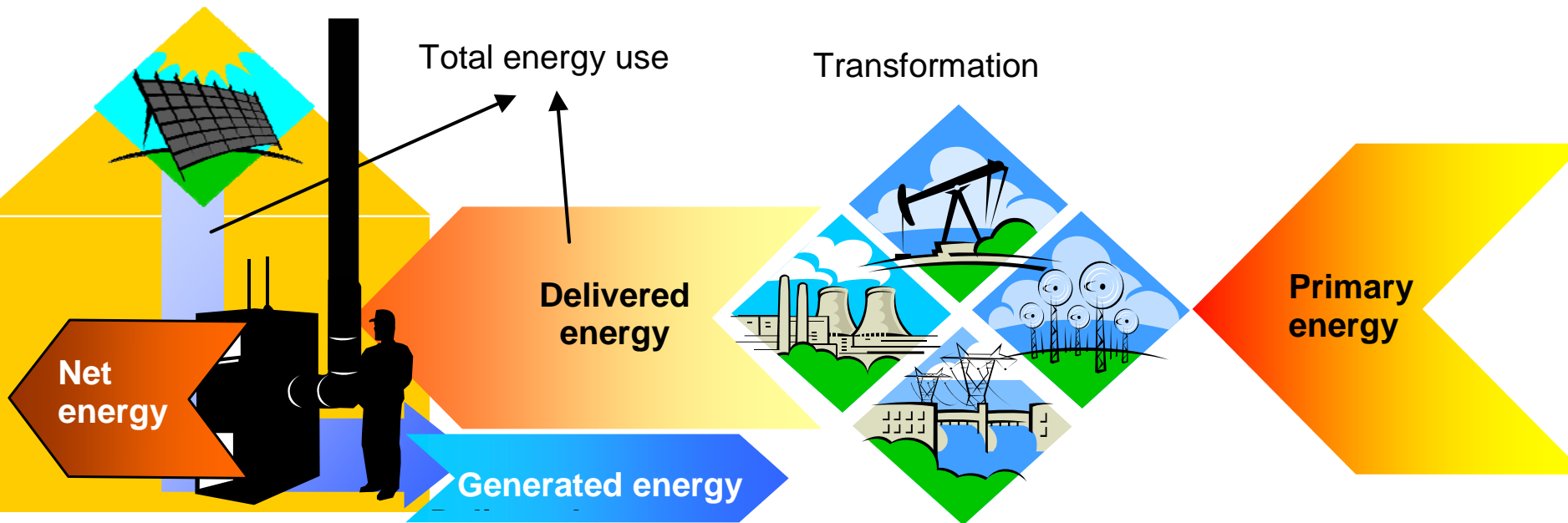
- integrate insulation, heating, cooling, ventilation, lighting and daylighting, renewable energy installations, passive solar heating and cooling systems, CHP, DH/C, position and orientation of the building
- give **flexibility** to designers to meet energy reduction standards in the most cost-effective way
- can be expressed in **simple energy indicators**
- **are adopted by Member States** for different categories of buildings taking into account climatic differences

**Lack of the detailed common methodology for characterizing the energy performance of buildings – a major difficulty for MS.**

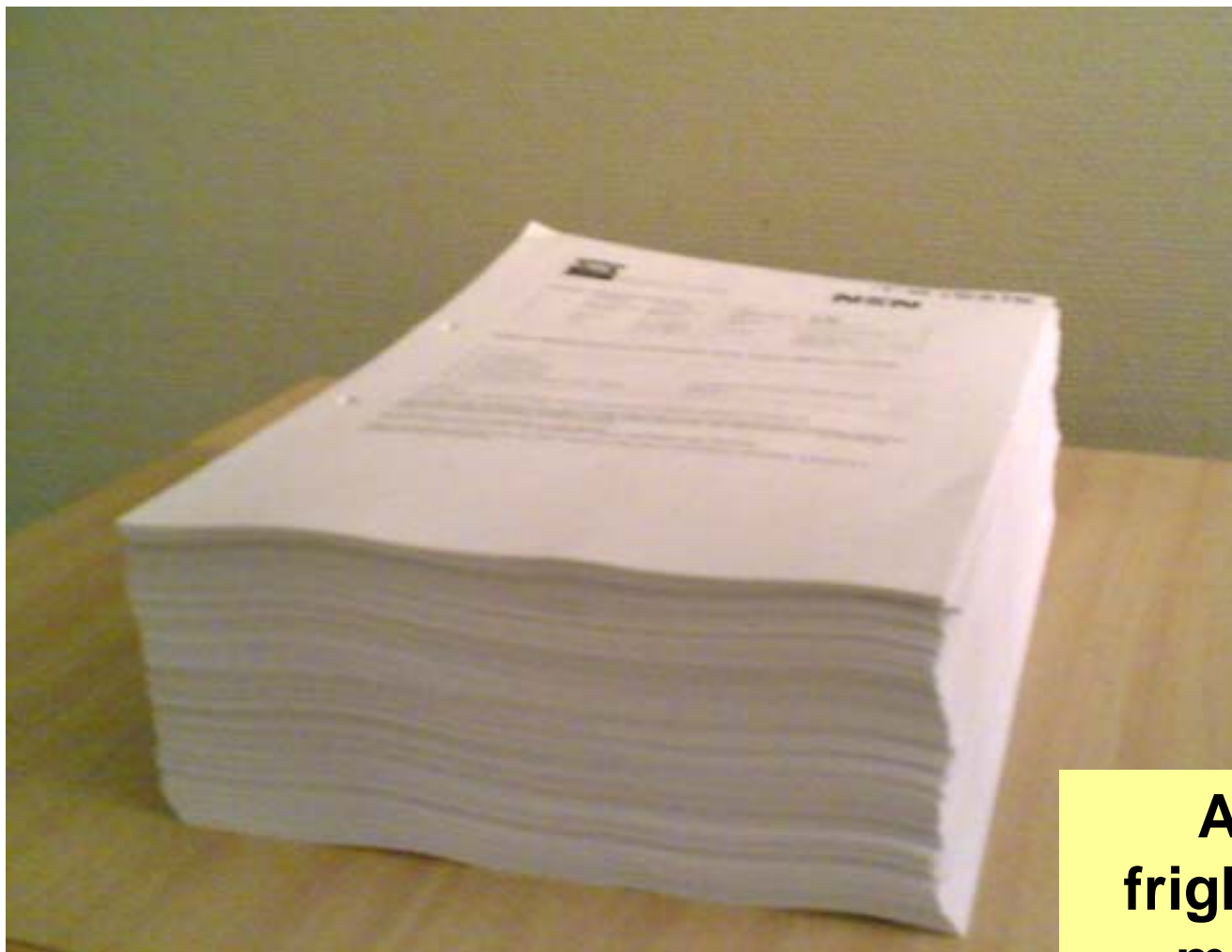
**Mandate to CEN to deliver suitable standards and an Umbrella Report, outlining the calculation procedure for assessing the energy performance of buildings.**



# Building & System Energy Demand



## The CEN solution...



**A little  
frightening,  
maybe?**

# Minimum standards for all buildings

## New buildings

Application of the minimum energy performance standards to all new buildings. Requirements should become more demanding than pre-EPBD national standards, and revised, at least, every 5 years.

Consider the feasibility of renewable energy, CHP, etc., for all new buildings over 1000 m<sup>2</sup>.

## Existing buildings

Application of the minimum energy performance standards to existing buildings larger than 1000 m<sup>2</sup> when they undergo a major renovation.

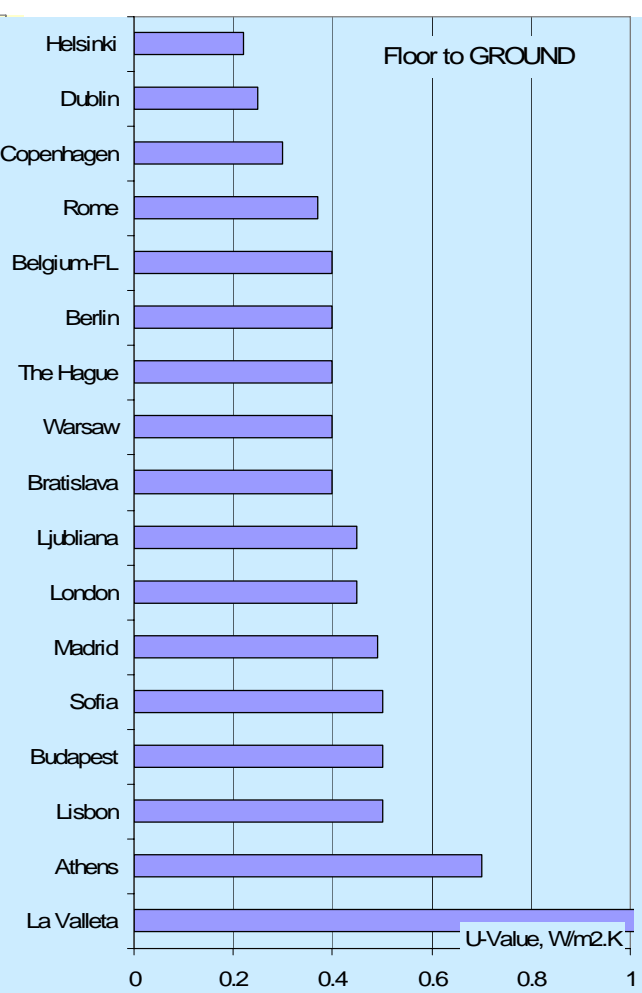
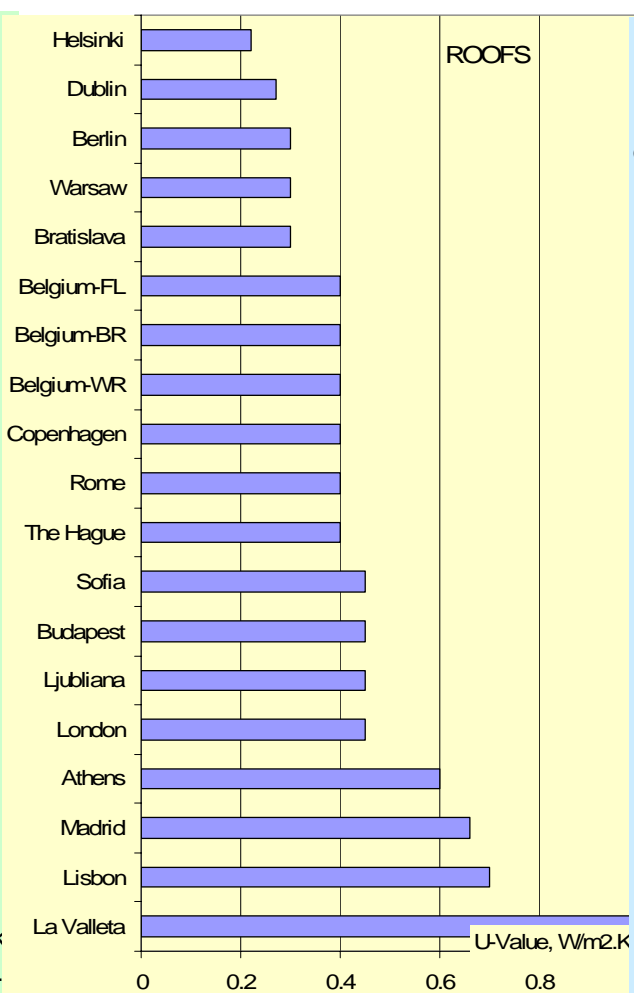
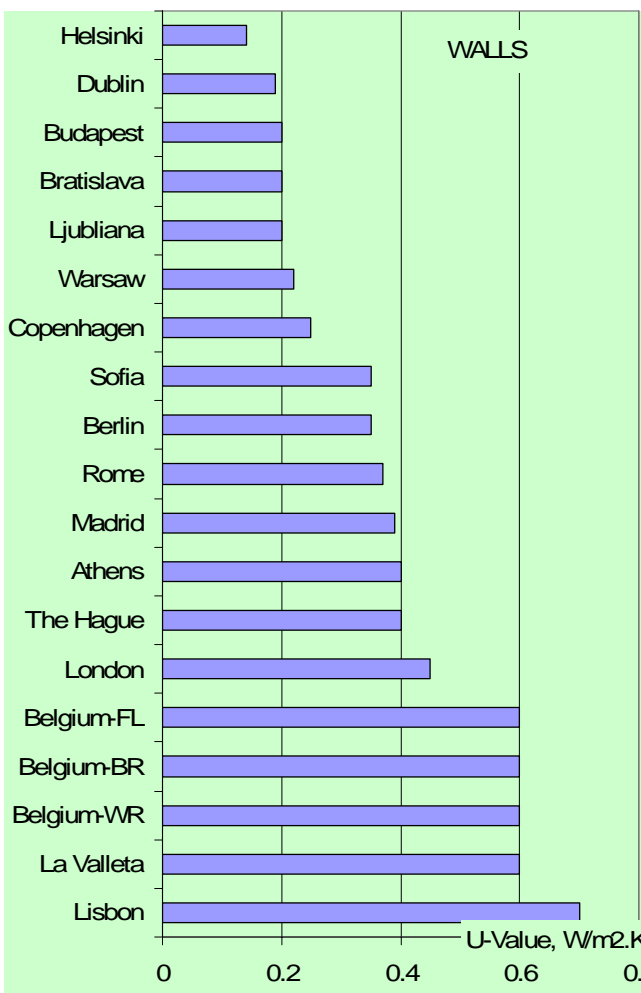
Most MS are adopting new, improved, more demanding building regulations.

Integration of Cooling requirements and difficult issues still lagging.



# Art.4 – Minimum Requirements

- Minimum U-values (indicative, often combined with global consumption targets)

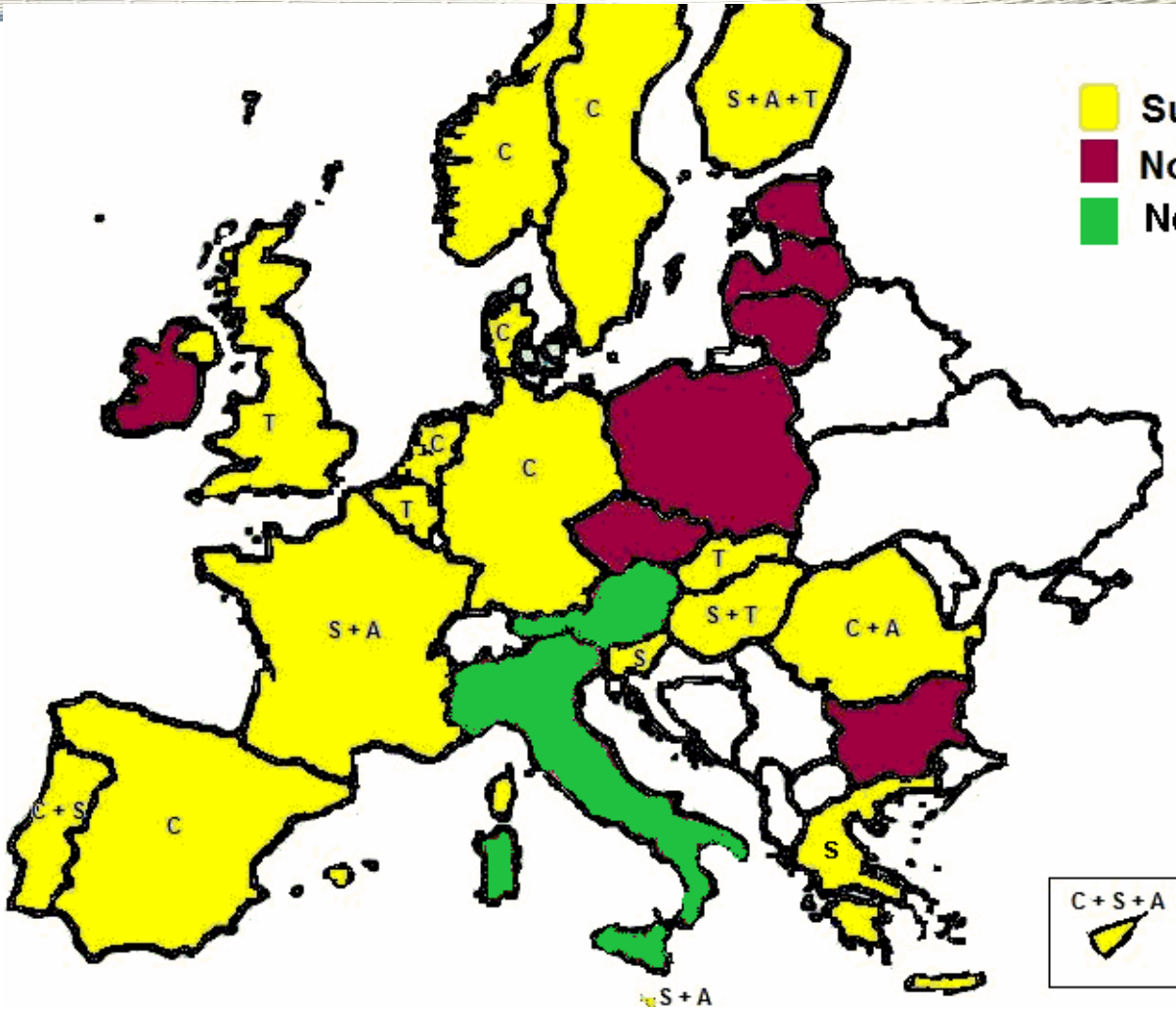


**County improvements ranged from 1% to 50%...  
with na overall 25% average increase in energy efficiency requirements.**

# Summer requirements in the new EU Building Regulations

- 
- The image shows a modern building facade with a curved, glass-enclosed structure. Below the facade, there is a photograph of a modern interior space, likely a dining or meeting area, with a long table and chairs.
- Unlike Winter regulations, Summer requirements in the EU countries adopt different strategies.
  - Main approaches:
    - Overheating avoided (calculate  $T_i$ ) – 7 countries
    - Cooling needs (energy) limits – 10 countries
    - Required shading of glazed areas – 8 countries
    - Max. area of glazing – 5 countries
    - No requirements – 3 countries
    - Planned for 2008 (no details yet) – 2 countries

# A geographical overview

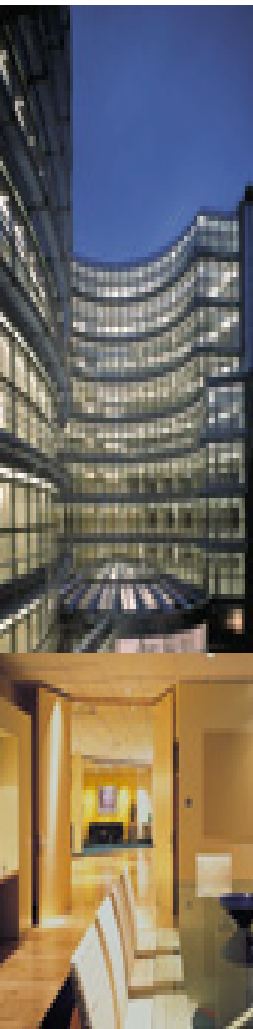


- Summer requirements
- No requirements
- New legislation in 2008

- C** – Cooling needs
- T** – Overheating calc.
- S** – Shading req.
- A** – Glazed area limit



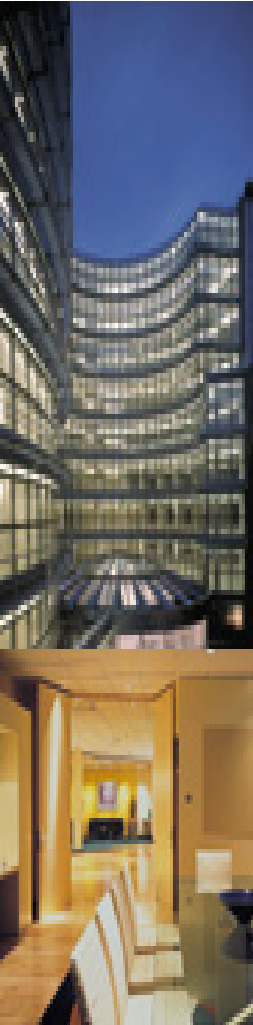
## Cooling Energy needs



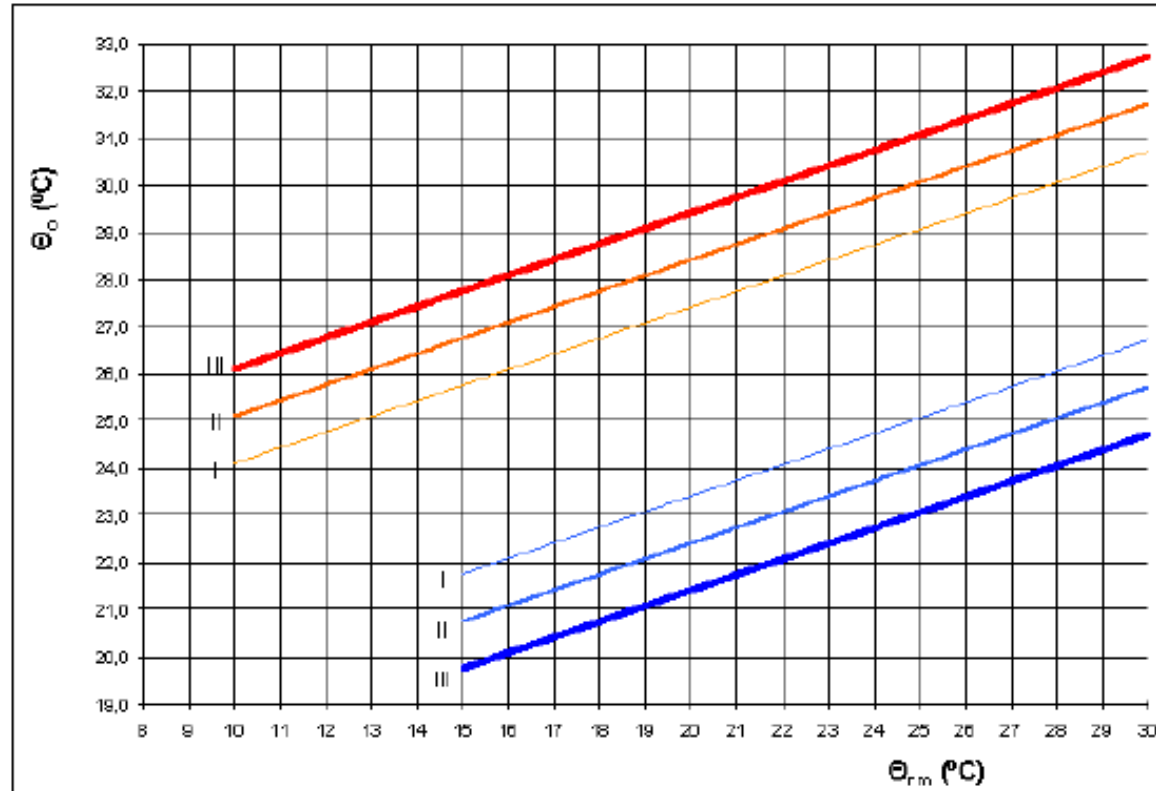
- The building is assumed to be air-conditioned in Summer, kept under a setpoint (e.g., 25°C). The cooling needs are then calculated and compared to a maximum allowable threshold;
- The calculation can be made with a simplified method or with a hourly simulation – both options possible according to the new EN ISO 13790;
- It provides a realistic estimate of actual cooling consumption if the building is air-conditioned (even if it has no AC “now”, the occupants can always add an AC equipment later if they feel hot and can afford it);
- If the building has no air-conditioning, the figure is simply a means for comparison with “good practice” design;
- As the cooling needs are seldom “zero” (even in the colder climates, there are a few “hot” days), this figure may suggest that an air-conditioner is always needed or recommended.

## Overheating calculation

- The internal temperature of the building without AC is assessed;
- This can be done by hourly simulation or using a simplified methodology (e.g., a mean value, or an extreme value);
- Regulations require that a certain max. threshold temperature, or the duration of overheating, should not be exceeded;
- This methodology promotes passive design, as it accepts a certain acceptable overheating (adaptive comfort), as long as it is not too important;
- If there is air-conditioning, this figure also can, to a certain extent, correlate to cooling energy consumption.



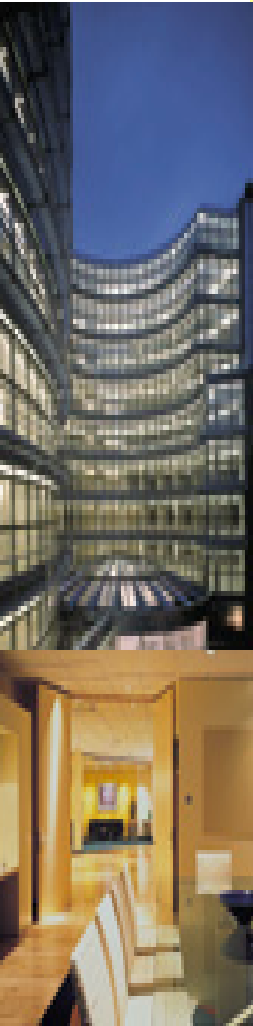
## Buildings without cooling systems in prEN 15251




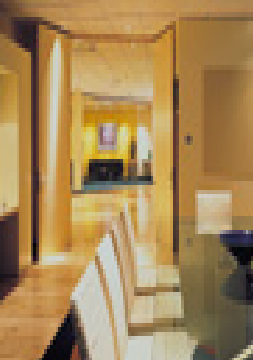
**The new EN comfort standard for the EPBD was revised to include the sound principles of adaptative comfort in naturally ventilated buildings.**

## Shading Requirements

- **Glazed areas, depending on, e.g., area, orientation, building inertia, etc., are required to have solar protection with a minimum quality (e.g., max. value of Solar Fraction);**
- **This is a “prescriptive” requirement, and it may cause some limits to architectural design freedom;**
- **A requirement in terms of solar fraction offers, however, diverse technical options (different glass, indoor or outdoor shading devices, etc.);**
- **It however gives the occupants an important adaptive control mechanism to reach comfort or reduce discomfort during Summer;**
- **It also reduces the cooling load of the building, directly reducing installed power and cooling energy needs.**

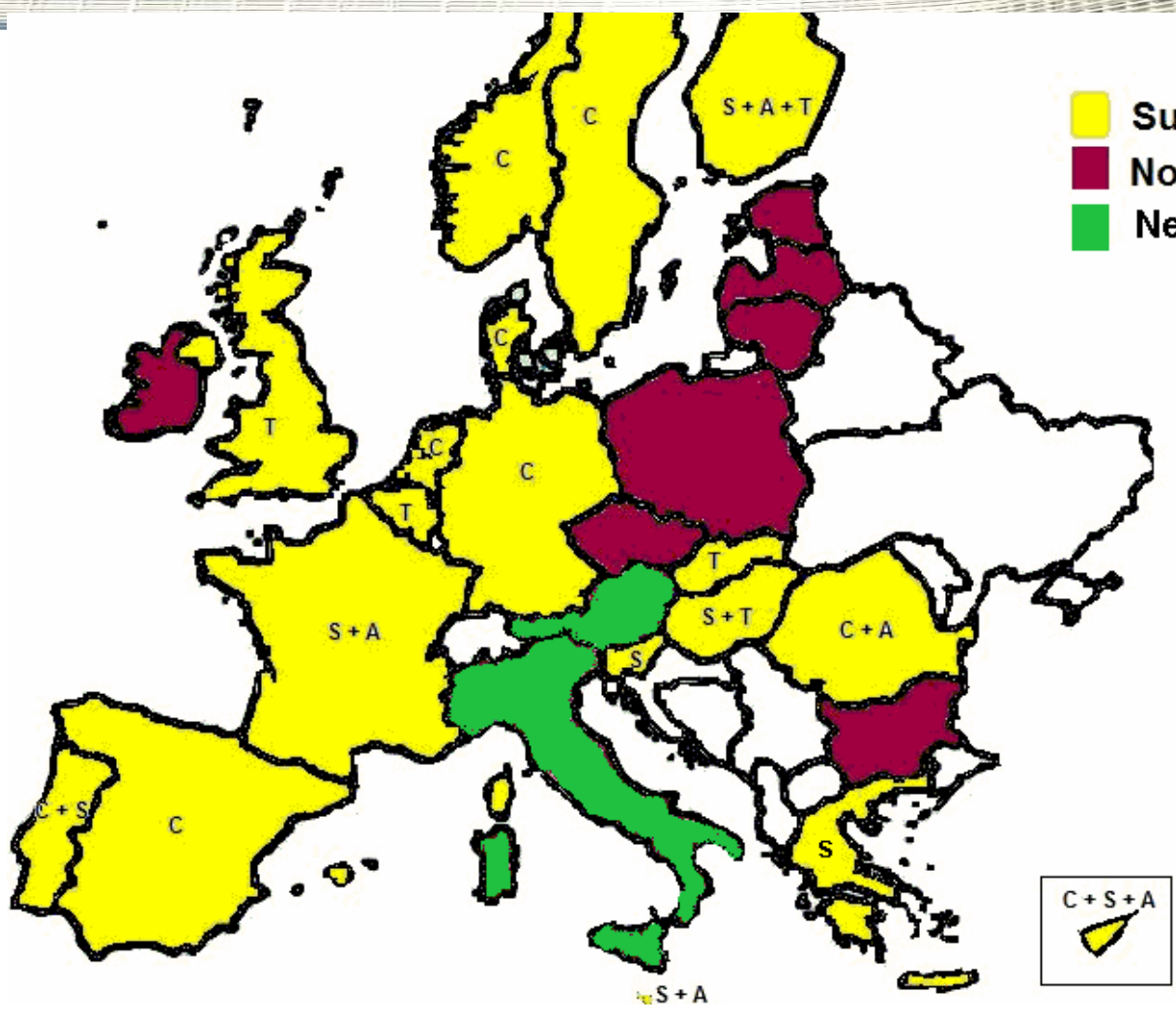


## Limits of Glazed Areas

- 
- 
- **Glazed areas, depending on, e.g., area, orientation, etc., are required not to exceed a certain percentage of the floor area of the building.**
  - **This is probably the most limiting requirement in terms of architectural design freedom;**
  - **It is however adopted from the colder climates (e.g., Finland) to the warmest (e.g., Malta), in countries with completely different societies and traditions;**
  - **It does point out designers towards “desirable” tendencies, but it may be too “prescriptive” if no compromise solutions are allowed (e.g., the limit can be flexible with better technical glass+shading solutions, resulting in comparable performances).**



# A geographical overview



- Summer requirements
- No requirements
- New legislation in 2008

- C – Cooling needs
- T – Overheating calc.
- S – Shading req.
- A – Glazed area limit

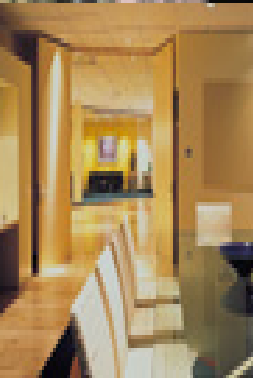


## Interaction between Winter and Summer requirements

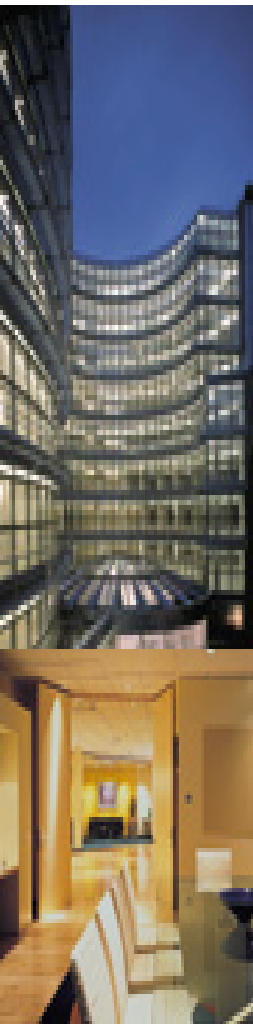
- Heating and cooling requirements coexist in many regions during different parts of the year.
- Regulations objectives must promote solutions that allow a good performance on a yearly basis;



- The overall objective could be, e.g.:
  - minimize overall energy consumption (heating + cooling) in buildings with AC;
  - Minimize heating needs and avoid overheating in non-conditioned buildings.


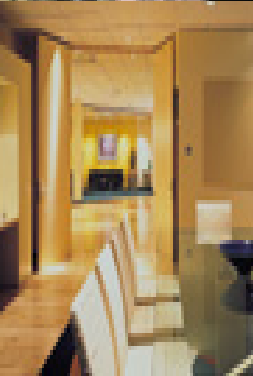


## Innovative Solutions



- No regulation should restrict the penetration of innovative solutions;
- By using the principle of “proof of equivalence”, any innovation should be allowed to demonstrate that it meets (or betters) required performances;
- If regulations are too prescriptive in terms of the performance of one particular parameter (e.g., glazed area, or solar factor), some innovative solutions may face unfair obstacles;
- Few EU building regulations allow, today, any practical possibility of the implementation of this “proof of equivalence”.

## EXPERTS

- 
- 
- How many experts are needed in each MS?
  - Which criteria and qualifications for accreditation of experts and inspectors?
  - Training inspectors
  - Degree of Independence
  - Code of Practice for Inspectors
  - Quality assurance for experts and inspections
  - National monitoring of inspections after 2006
  - Insurance and Liability

The lack of a sufficient number of accredited experts is accepted by the EPBD as sufficient reason for a **postponement of the start of Certification activities for up to 3 years** (up to 4 January 2009), and almost all MS are taking advantage of this opportunity to delay its implementation.

# Inspection and assessment of heating & cooling installations

## Heating systems

- Inspected regularly: boilers with an effective rated output between 20 kW and 100 kW
- Inspected every 2 years: boilers with an effective rated output over 100 kW
- Boilers larger than 20 kW and older than 15 years: the entire heating installations should be inspected. Advice should be given on alternative solutions which could reduce energy consumption

## Cooling systems

Regular inspection of air-conditioning systems with an output of more than 12kW, including room systems used together.

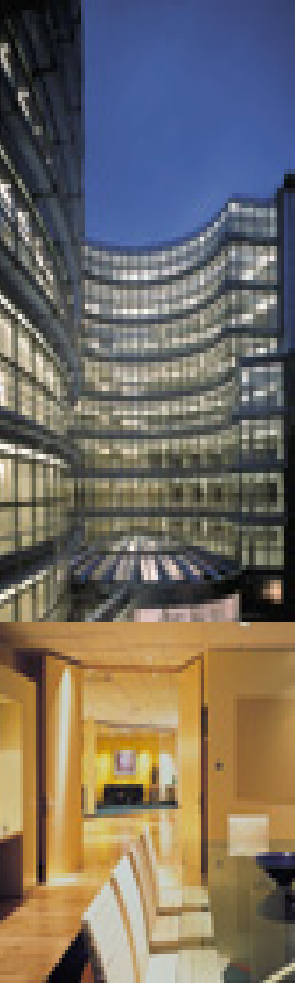
**Inspections of boilers can be replaced by information campaigns.**

## 12 kW per Building or per Equipment?

- Many MS are still debating how to apply this requirement.
- The EPBD states that, from the inspection, advice should be produced about the correct sizing (or oversizing) of the equipment relative to the building – difficult to accomplish on a per unit basis.
- If inspections are “per unit”, splits may be the best solution to avoid them...



## Future Perspectives

- 
- The image shows a modern building with a curved, glass facade. The top part shows the exterior at dusk, and the bottom part shows an interior view of a meeting room with a long table and chairs.
- **The EU Council approved the “Energy Action Plan” in March 2007;**
  - **This Plan explicitly includes the intention to revise the 2002 EPBD towards a higher level of requirement:**
    - **MS to meet certain mandatory energy-efficiency levels, rather than leaving these targets to the individual initiative of the EU MS;**
    - **Prepare the path for every new building to perform as what a few countries today designate as “passive building” standards.**

EUROPEAN COMMISSION


 Directorate-General for Energy and Transport

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 Energy Performance of Buildings Directive
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## :: EPBD - Energy Performance of Buildings Directive

### Note to our visitors:

Navigate through our site but please visit us again soon.

The site is still under development and various databases will be included in order to offer you more services in the weeks and months to come.

If you want to be kept informed about new developments, don't forget to [register](#).

Reducing the energy use of buildings without compromising the indoor environment and services is the key challenge for Europe. The implementation of the Energy Performance of Buildings Directive provides Europe with tools for this.

The **EPBD Buildings Platform** is an information service for helping the implementation of the Buildings' Directive. This service is useful for practitioners and consultants, experts in energy agencies, interest groups and national policy makers in the 25 Member States plus Bulgaria and Romania.


Its objective is to support the full and continued implementation of the EPBD by:

[> News](#)

### :: Buildings performance congress

(Frankfurt, 23-27 April 2006) [[more](#) 

### :: EPBD conference

(Budapest, 10-12 May 2006), with the special SAVE-ENPER-Exist session [[more](#) 

# Let's however conclude on a very positive note!



- Yes, many challenges still remain, and there are delays.
- But a lot has already been accomplished!
- All MS building regulations were improved...
- Even Northern European countries (and a few Southern countries too...) have introduced new requirements for better performance in summer (no longer insulation regulations alone)...
- With a delay, with more or less enthusiasm or level of detail, Energy Certification of buildings will become a reality in every EU country...
- After this first round, the new political negotiations for revising the EPBD in 2009 will create another measurable leap towards building energy efficiency...
- This must be taken as a continuous process towards the larger overall goal, a small step at a time...



**Although the foundations  
have been laid...much work is  
still to be done**

**And it will take a few years to  
get to where we wish...**