



Contract No. EIE-2003-RURASU-223

Deliverable D.3.1

Report on requirements of the EC Building Directive

December 2005

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Funded by the European Commission Intelligent Energy for Europe Programme

Table of contents

1	General introduction.....	4
2	Problem definition and goals.....	5
3	Report from Germany.....	5
3.1	Existing legislation	5
3.2	Realisation of the main issues	7
3.2.1	Article 3: Adoption of a methodology	7
3.2.2	Article 4, 5 and 6: Setting of energy performance requirements in new and existing buildings.....	8
3.2.3	Article 7: Energy performance certificate	8
3.2.4	Article 8 and 9: Inspection of boilers and air-conditioning systems.....	8
3.2.5	Article 10: Independent experts	9
4	Report from Scotland	10
4.1	Introduction.....	10
4.2	Content of the New Building standards	10
4.2.1	Article 3 – Adoption of a methodology	10
	Dwellings	10
	Non-domestic buildings	10
4.2.2	Article 4 – Setting of energy performance requirements.....	11
4.2.3	Article 5 – New buildings	11
4.2.4	Article 6 – Existing buildings	12
4.2.5	Article 7 – Energy Performance Certificates.....	13
4.2.6	Article 8 – Boilers.....	15
4.2.7	Article 9 – Air-Conditioning Systems	15
5	Report from Spain	17
5.1	Existing legislation	17
5.2	Realisation of the main issues	18
5.2.1	Article 3: Adoption of a methodology	18
5.2.2	Article 4, 5 and 6: Setting of energy performance requirements in new and existing buildings.....	20
5.2.3	Article 7: Energy performance certificate	20
5.2.4	Article 8 and 9: Inspection of boilers and air-conditioning systems.....	22
6	Report from Greece	22
6.1	Existing legislation	22
6.2	Realisation of the main issues	22
6.2.1	Article 3: Adoption of a methodology	22
6.2.2	Article 4, 5 and 6: Setting of energy performance requirements in new and existing buildings.....	23

6.2.3	Article 7: Energy performance certificate	24
6.2.4	Article 8 and 9: Inspection of boilers and air-conditioning systems.....	24
6.2.5	Article 10: Independent experts	24
7	General conclusions	25

1 General introduction

In the Official Journal of the European Communities of 4 January of 2003 the Directive 2002/91/EC of the European Parliament and of the Council of 16 December of 2002 on the energy performance of buildings was published . In Article 1 the objective of the directive is given as follows:

Article 1

Objective

The objective of this Directive is to promote the improvement of the energy performance of buildings within the Community, taking into account outdoor climatic and local conditions, as well as indoor climate requirements and cost-effectiveness.

This Directive lays down requirements as regards:

- (a) the general framework for a methodology of calculation of the integrated energy performance of buildings;
- (b) the application of minimum requirements on the energy performance of new buildings;
- (c) the application of minimum requirements on the energy performance of large existing buildings that are subject to major renovation;
- (d) energy certification of buildings; and
- (e) regular inspection of boilers and of air-conditioning systems in buildings and in addition an assessment of the heating installation in which the boilers are more than 15 years old.

Furthermore the directive demands the determination of the energy performance of a building (Article 4). This shall be achieved by the measurement of the energy consumption. More detailed information on the energy sources and sinks would give a balance of energy flows with data about inputs and outputs. Based on these data energy performance certificates shall be issued (Article 7), which allow the classification of buildings in correspondence with their energy performance. In order to fulfill all these requirements the need for advice and energy consultation will rapidly increase. This demand can partly be met by Design Advice Support Units (DASU) whose implementation is promoted by RURASU.

2 Problem definition and goals

According to Article 15 of the Directive 2002/91/EC the Member States shall transform the contents of the directive until 4 January 2006 by bringing laws and regulations into force. However, progress, methods and contents of the realisation differ largely among the Member States. This is mostly due to various climatic conditions, different traditions in the building sector, varying architectural purposes and, of course, great differences in the state of know-how among the planning and executing sectors.

Thus, the goal of this report is to identify the state of the transformation as given by the EC Building Directive in countries, which participate in RURASU (Germany, Scotland, Spain, Greece) and in which Design Advice Support Units (DASUs) will be or were implemented.

3 Report from Germany

3.1 Prospected legislation

The introduction of the new ENEV already has undertaken the first legislative steps:

- A draft was presented by the Ministry in November 2006
- The Federal Cabinet adopted the draft in April 2007
- The final adoption of the Federal Cabinet is expected for July 2007
- It is expected that the new legislation will get into force in September / October 2007

3.2 Existing legislation

Laws, orders and norms. For the realisation of the EC Building Directive there are the following laws, orders and norms available:

- Energy Economisation Law of Energy (EnEG) of 22 July 1976, a draft of the amendment is available since 12 April 2005
- Energy Economisation Order (EnEV) of 1 February 2002
- in Bavaria: Order for the jurisdiction and implementation of the EnEV (ZVEnEV)
- Federal Immission Protection Order, particularly 1. BlmschV
- DIN V 4108-6 and DIN V 4701-10 and further harmonised norms for the fulfillment of the EnEV

The given references have already been applied or are about to be either revised or newly established:

Actual situation. The Energy Economisation Law of Energy (EnEG) of 22 July 1976 and the Energy Economisation Order (EnEV) of 1 February 2002 already contain essential elements of the EC Directive, but only concerning the demand for heating,

aeration and hot water. The law and the order are being adjusted fully to the directive requirements. The draft of the amendment has already been discussed in a first lecture at the German Bundestag mid-April 2005.

The calculation norm DIN V 4108-6 has been introduced as the national norm of the DIN EN 832 for the building structure and of the DIN V 4701-10 for the technology sector. Both norms cover the fields of heating, aeration and hot water.

The EnEV exclusively refers to new buildings and to substantially modified old buildings.

In order to cover all buildings under the aspect of energy, it is planned to introduce an energy pass for all existing buildings and new constructions. For this purpose, a field test has been conducted under the control of the Deutsche Energie Agentur (dena) in 2004 to test the energy pass for residential buildings.

The field test had been developed in 2002-2003 with the involvement of all important market players (Industry, handcraft, housing industry, architects and engineers, tenant- and consumer councils) and had been implemented from November 2003 to December 2004. Preparation and implementation had been organized in close coordination with the Federal Ministry for Economic Affairs and Employment, the Federal Ministry of Transport and the Federal Ministry for Environment, who are presently working on the realisation of the EU Directives for buildings.

During the field test more than 4 100 energy passes were issued in 33 regions of Germany. Numerous regional cooperation partners, so called participants, were involved, amongst others 31 residential construction associations with more than 800 000 accommodation units and 35 communes with more than 12.5 Mio. inhabitants. Issuers were craftsmen, engineers, architects and energy consultants. More than 1 000 qualified experts have registered in the "issuers' database".

One of the participants in this model test was a cooperation between the

- city of Augsburg
- energy community of Augsburg
- chamber of crafts for Swabia
- eza!

By this cooperation the field test was implemented successfully by issuing about 150 energy performance certificates called "Energiepass Schwaben". Thereby, important experiences regarding the qualification of the issuers were collected as the energy performance certificates underwent a quality control.

The whole field test was scientifically evaluated by the Fraunhofer Institut für Systemtechnik and the Innovationsforschung (ISI) in cooperation with the Fraunhofer Institut

für Bauphysik and the Ökō-Institut. This field test will continue under different conditions in 2005.

The results of the field test are evaluated by the ministries and will be incorporated into the preparations for legislation.

The inspection and measuring of heating systems based on the 1. BlmschV, the EnEv and the ZVEnEV is conducted by chimney sweepers. Eventually, respective adjustments will be made following the EC directive.

Objective. The objective is to adjust and extend the existing instruments in the way that they fully comply with the EC directive. The application area of the EnEG will be extended to lighting and air-conditioning. The draft of the EnEG of 12 April 2005 has already been discussed in a first lecture at the German Bundestag. Its adoption was performed in September 2005.

The EnEV as executive regulation will be adapted along the requirements of the EnEG.

Regarding the energy certificate it is planned to revise the energy pass form, which was based on the field test participants, so that it will match the requirements of the legislation.

The DIN 18599 is mostly finished and was implemented in November 2005.

3.3 Realisation of the main issues

3.3.1 Article 3: Adoption of a methodology

Due to the different usage requirements, the methods were split for heating, aeration, and hot water as well as lighting and air-conditioning.

Heating, aeration and hot water. The EnEV defines the general framework and the calculation based on the norms DIN V 4108-6 (building mantle) and DIN V 4701-10 for the technology in new constructions (hot water, aeration and heating), as well as DIN V 4701-12 and PAS 1027 for the technology in old buildings.

Above norms take into consideration the required characteristics listed in the attachment: thermal characteristics, heating system and hot water supply including isolating materials, aeration, location and orientation of the building, comprising outside climate, passive solar use including solar protection (DIN 4108-2), natural aeration, inside climate, active solar systems, and cogeneration. They are basically valid for all buildings. They are used especially in the field of residence.

These calculation norms have already been implemented in numerous application programs. They have been tried in the field test and are used for the issue of energy requirement passes according to the specifications of the EnEV.

Lighting, air-conditioning. In order to comply fully with the requirements of the EC directive the DIN 18599 was introduced as a complement to the above mentioned norms, especially for non-residential buildings and for all those buildings, where lighting and air-conditioning plays an important role. The DIN 18599 was published in November 2005. Corresponding software is available for experts. This norm comprises 12 points:

1. General issues
2. Useful energy, heat and coldness
3. Useful energy air-conditioning
4. Lighting
5. Heating (static)
6. Cooling (static)
7. Aeration technology/residence aeration
8. Drinking water
9. Multifunctional generating processes
10. Constraints
11. Examples
12. HP-balancing method

3.3.2 Article 4, 5 and 6: Setting of energy performance requirements in new and existing buildings

The requirements, which have been enumerated in this article, are regulated by the new Energy Economisation Law of energy and the new Energy Economisation Order.

3.3.3 Article 7: Energy performance certificate

The issue of energy passes will be regulated in the new Energy Economisation Law of Energy and the new Energy Economisation Order. Presumably two kinds of energy passes will be issued:

- The demand-oriented energy pass, mainly for small residential units and non-residential buildings
- The user-oriented energy pass for bigger residences

3.3.4 Article 8 and 9: Inspection of boilers and air-conditioning systems

The inspection of central-heating boilers by chimney sweepers are based on the Federal Order of Immission Control (BlmSchV). Flue gas ways are checked and the emissions of the central-heating boiler is measured. Besides, the chimney sweepers control every five years the specifications of the Energy Economisation Order regarding the chimney systems, especially their regulation technology. The corresponding regulations are already valid for boilers with 15 kW. The inspection periods of two

and four years of the EC directive have already been followed or even fallen short of. Conventional combustion systems without fuel value usage are checked and measured every year.

The inspection of air-conditions will presumably be regulated in the new Energy Economisation Order combined with the DIN 18599.

3.3.5 Article 10: Independent experts

In order to put the requirements of the EC directive into action, skilled personnel will be available or trained. For the model test on the energy pass only the following people were admitted to issuing energy passes:

- master craftsmen from relevant trades (e.g. carpenter, heating system installations, chimney sweeper), who qualified as professional energy consultant by attending a 240-hours professional training. They are allowed to issue energy passes for residential buildings with up to four apartments in a so-called shortened process
- Engineers from relevant areas (maintenance, construction) and architects, who absolved a qualified training as energy consultant on site under the guidelines of the Federal Ministry of Economic Affairs and Export Control (BAFA). They are allowed to issue energy passes in a so-called detailed process, which comprises mainly bigger buildings with more than four apartments. Also in the future, they will examine non-residential buildings on the basis of DIN 18599.

For the future final regulation probably the federal states will remain in charge. The issue of energy demand pass under the Energy Economisation Order has been regulated by the federal states so far. Chimney sweepers are already qualified for the inspection of boiler systems.

4 Report from Scotland

4.1 Introduction

The current status of EPBD implementation in Scotland is taken from the Scottish Buildings Standards Agency (SBSA) website (www.sbsa.gov.uk). There are a few differences with the situation in England and Wales, mainly concerning the implementation timetable, but the methods adopted are essentially the same. Although energy matters are generally reserved to the UK Government, building legislation and promotion of energy efficiency are devolved to the three Administrations: Scotland, England and Wales, and Northern Ireland. The EPBD is being implemented in Scotland by the SBSA which has been set up as an executive agency of the Scottish Executive.

4.2 Content of the New Building standards

On the 1st of May 2005 a new building standards system came into operation in Scotland. This is the outcome of a review which has lasted approximately six years and the primary legislation resulting from this is the Building (Scotland) Act 2003. The new Act makes implementation of the EPBD possible, under one piece of legislation. Some aspects of the Directive, in particular the setting of energy standards and energy certification, build on what already exists in Scotland. However the introduction of inspection of boilers and air-conditioning systems from an energy perspective is a totally new concept in terms of building standards legislation.

4.2.1 Article 3 – Adoption of a methodology

Dwellings

“The Government’s Standard Assessment Procedure for Energy Rating of Dwellings” 2005 edition (SAP 2005) has been adopted as the principal methodology/tool for dwellings.

Non-domestic buildings

For non-domestic buildings, the asset based energy rating methodology, ‘Simplified Building Energy Model’ (SBEM) has been adopted as the principal non-domestic methodology/tool required by this Article. Both of these tools are set at a national (UK) level. However, SBEM will use Scottish climate data instead of the UK data used in SAP.

The energy performance of a building using the above tools will be reflected in a CO₂ emission indicator. A reduction in CO₂ emissions is one of the principal ‘drivers’ for the Scottish Executive’s policy to encourage energy efficiency in use of buildings. It is therefore considered that such an indicator is the most transparent manner to meet the requirements of the Directive.

4.2.2 Article 4 – Setting of energy performance requirements

In terms of revision programme, the situation in Scotland is different to the situation in England and Wales. The review of the Scottish energy standards commenced last year but the outcome will not be finalised until early 2007. The Scottish review is driven by the 'Partnership Agreement' which states – “We will strengthen building standards to ensure that energy conservation levels improve to high and effective levels and consult on ways to ensure that new homes and public buildings increasingly incorporate solar power or other renewable energy sources.” The Directive requires a review of energy standards every 5 years. The outcome of the last review of Scottish energy standards for buildings was implemented in March 2002. In order to comply with Article 4(2) of the Directive, the methodology and tools have been used to reverse-engineer existing Scottish energy standards and guidance to recast them as 'whole-building' energy performance figures and express them again in elemental terms.

Compliance of dwellings using the new methodology

SAP 2005 has now been finalised and Scottish Ministers have decided that this methodology/tool will be used in guidance to establish the Scottish building regulations level of energy performance for new dwellings. This will not appear in the current edition of the Domestic Technical Handbook but will be incorporated into Section 6 of the Handbook when new guidance is drafted to accompany the 2007 revisions. Public consultation on the level of energy performance that should be attained in the future using this methodology is currently in progress. The following links give access to further information.

- the SAP 2005 methodology – <http://www.bre.co.uk/sap2005/>
- the Section 6 public consultation – http://www.sbsa.gov.uk/current_standards/sectionsixconsultation.htm

Compliance of non-domestic buildings using the new methodology

SBEM has now been finalised and Scottish Ministers have decided that this methodology/tool will be used in guidance to establish the Scottish building regulations level of energy performance for new non-domestic buildings. This will not appear in the current edition of the Non-domestic Technical Handbook but will be incorporated into Section 6 of the Handbook when new guidance is drafted to accompany the 2007 revisions. Public consultation on the level of energy performance that should be attained in the future using this methodology is currently in progress. The following links give access to further information.

- the SBEM methodology – <http://www.ncm.bre.co.uk/>
- the Section 6 public consultation – http://www.sbsa.gov.uk/current_standards/sectionsixconsultation.htm

4.2.3 Article 5 – New buildings

The new Scottish building standards system will be used to ensure that new buildings meet the minimum energy performance requirements referred to in Article 4. This is mainly

through the process of obtaining building warrants and the acceptance or rejection of completion certificates but there are enforcement procedures for contraventions. In practical terms, because energy standards have not been raised at the time of Directive implementation, industry will still tend to use the existing compliance guidance available in Section 6 of the current 2004 edition of the Technical Handbooks (including SAP 2001).

The second paragraph of Article 5 requires Scottish building regulations to take decentralised low carbon and zero carbon energy generating technologies into consideration (where technically, environmentally and economically feasible) for new buildings which are over 1000m² in floor area. Traditionally Scottish building regulations set mandatory standards and this has been carried forward into the new system with the introduction of functional standards. Consequently mandatory standards are the legislative vehicle of choice for delivering this Article. A study was commissioned to explore this approach. The report by the Building Research Establishment (BRE) provides an overview of the low and zero carbon technologies (LZCT), indicating the specific technologies that are potentially available, giving a brief description, an indication of their possible contribution to reducing emissions and a summary of other issues. The report by BRE recommends that:

- For the foreseeable future, LZCT should not be made mandatory in Scottish Building Regulations.
- To progress the take-up of LZCT, the current review of Section 6 (Energy), which is giving consideration to setting a CO₂ emissions compliance target as a part of a whole energy building approach, should look to set this target at a sufficiently demanding level. If the correct balance is struck, the effect will be one that allows new buildings to be constructed using the traditional conservation of fuel and power approach, but at the same time makes it more attractive for designers to consider adopting LZCT as a part of that approach.
- Consideration should also be given at this stage to the effects of LZCT becoming fully developed and the implications of each technology with regard to the 64 existing mandatory functional standards within the Scottish building regulations.

4.2.4 Article 6 – Existing buildings

This Article of the Directive requires minimum energy standards to be applied to large buildings when they are renovated. The new Scottish building standards system is used to ensure that this occurs. This is mainly through the process of obtaining building warrants and the acceptance or rejection of completion certificates but there are enforcement procedures for contraventions. These standards are set elementally by a ‘reverse engineering’ approach to the energy performance requirements set using the Article 3 methodologies. Article 6 covers the upgrading of buildings being renovated/altered to those with a floor area of over 1000m². However, Scottish standards apply irrespective of floor area. The Directive gives 2 options; requirements may be applied to improve the energy performance of the whole building or to the altered systems/ components. Scottish legislation currently exceeds the latter option in

that where alterations occur to buildings (even those that are less than 1000m² in area), the new work needs to meet the standards.

Articles 7, 8 and 9 are still under consideration, although the public consultation process is now complete.

4.2.5 Article 7 – Energy Performance Certificates

For Energy Performance Certificates, the proposed timetable for both domestic and non-domestic buildings is May 2007 for “post-construction” (to tie in with the revised Scottish Building Standards); early 2008 for “at sale” (to tie in with the timing likely for the proposed introduction of the ‘Single Survey’) and January 2009 for “at rental” (the latest date the Directive must be implemented by - this applies to social housing providers and private landlords). The suggested changes include a general move to a ‘whole building’ approach for both dwellings and non-domestic buildings using the methodology required by Article 3 of the EPBD. The calculation tools given in the guidance to Section 6 are SAP 2005 and the Simplified Building Energy Model (SBEM). The output from both of these tools gives the indicators necessary to generate energy performance certificates.

For newly constructed dwellings, it is proposed that SAP 2005 will be used when a dwelling has a floor area of 450m² or less, with SBEM being used for larger dwellings. It will also be possible for a new dwelling to be designed and subsequently constructed without using a methodology or putting input data into a calculation tool. The construction parameters in such cases are well enough defined to allow a simplified approach to calculation of energy performance for the purposes of an EPC to be presented to the verifier along with the completion certificate. It is proposed that one way of doing this would be to submit an EPC which has been calculated using RDSAP.

For newly constructed non-domestic buildings, SBEM will be used for simple buildings. It is anticipated that the complexity of some buildings will require the use of a detailed simulation model. A detailed simulation model has yet to be developed and adopted as a part of the UK methodology arrangements, but there is the scope for commercial software vendors to “make this possible”.

For sale of existing dwellings, generally there is less construction information known or that can be readily established. A desk-top study may reveal the original date of the building warrant application and even ‘as-built’ drawings. A site inspection will identify certain information that is readily accessible, but much information (particularly about the building fabric) will remain hidden. It is not proposed however that an intrusive survey should be carried out on an existing dwelling, unless this is specifically requested by the owner who commissions the energy performance certificate. Consequently it is appropriate that a less-detailed approach is used for calculation purposes when sale of an existing dwelling is to be carried out. It is

proposed that one way of achieving this would be to use RDSAP for calculation purposes and the subsequent generation of an energy performance certificate.

Similar considerations pertain for the sale of non-domestic buildings. Consequently it is appropriate that a slightly less-detailed approach is used for calculation purposes when sale of an existing non-domestic building is to be carried out. It is proposed that one way of achieving this would be to use the inference version of SBEM for calculation purposes and the subsequent generation of an energy performance certificate. N.B. if more accurate information is held about such buildings, it is proposed that nothing would prevent the use of the new-build version of SBEM. For complex buildings, detailed simulation models could be used when they become available.

It is proposed that the Energy Performance Certificate should display as a minimum, the following information:

- the postal address of the building for which the certificate is issued;
- the organisation issuing the certificate and its postal address;
- the methodology/tool used for certification;
- a specific indication of CO₂ emissions expressed in kg/m² floor area/annum
- an eight band scale representing the following bands of CO₂ emission expressed in kg/m² floor area/annum:
 - AA (-20 to -1),
 - A (0 to 15),
 - B (16 to 30),
 - C (31 to 45),
 - D (46 to 60),
 - E (61 to 80),
 - F (81 to 99),
 - G (100+),

with a letter band indicating the current rating in a '+' and a '-' format and a letter band indicating the current building regulations compliance benchmark in a similar format;

- the type of fuel serving the main heating system;
- whether or not there is any form of building integrated renewable energy generation;
- an approximate indication of energy use expressed in kWh per m² of floor area per annum;
- the date of certificate issue; and
- a list of cost-effective improvements.

It has been said in that terms of dwellings, it is important to give out the message that although small properties emit more CO₂ per m² of floor area than large dwellings (built to a near identical specification), they emit less CO₂ overall, simply because they are smaller. In view of this, it is possible to take the influence of floor area out of the banding arrangement and provide a carbon dioxide emissions index.

Model certificates for dwellings and for all other buildings can be downloaded at www.sbsa.gov.uk/pdfs/epc_dwelling.pdf and www.sbsa.gov.uk/pdfs/epc_otherbuildingtypes.pdf respectively.

4.2.6 Article 8 – Boilers

It is proposed that option (b) of Article 8 will be adopted to effect EPBD implementation. This “provision of advice” route will be broadly in line with the rest of the UK. It is likely however, that the provision of advice to users of boilers in Scotland will be delivered with a slightly different approach, rather than the Department of Environment, Food and Rural Affairs (DEFRA) proposals which currently intend to link the advice to annual boiler maintenance contracts. The provision of advice to users of existing boilers, on boiler replacement, associated heating system modifications, boiler efficiency and appropriate sizing, is several stages beyond minimum building standards. The SBSA therefore have engaged with the Energy Saving Trust (EST) as a partner organisation to deliver this requirement. A ‘user friendly’ boiler advice leaflet for domestic boilers has been prepared by the EST with support from the SBSA. For non-domestic boilers the possibility of using existing leaflets which have been prepared by The Carbon Trust, is being explored. These leaflets (for both domestic and non-domestic boilers) will enable users to ascertain important energy efficiency information about their existing systems and thereby increase public awareness on this matter. They will also provide information on where to seek further advice. It is considered that most people value highly the information that they have established for themselves.

4.2.7 Article 9 – Air-Conditioning Systems

Article 9 of the Directive requires:

- regular inspection of air conditioning systems over 12kW
- an inspection report
- an assessment of the capacity of the system, with recommendations for its improvement or replacement.

The detail and form of the report has yet to be decided upon. Current thinking is that the format will be in the form of a checklist with a ‘traffic light’ system of alerting the user of the air-conditioning system to what requires attention and finishing with a summary statement. It is suggested that an independent expert carrying out the inspection of air-conditioning systems has a degree of flexibility when setting the frequency of inspection. This would allow owners/users of systems that are energy efficient and well maintained to receive some credit and encouragement for being proactive. Consequently it is proposed that the inspection interval is between three and five years, with three years allocated to systems that are poorly maintained and inefficient and five for those that are in the best condition and most efficient.

It is proposed that inspections will commence once the protocol and training has started. It is intended that this will commence no later than January 2009. Phased implementation of inspection will start according to the effective rated output of air-conditioning systems. The largest systems will be tackled first, medium sized units second and finally the smaller systems.

5 Report from Spain

5.1 Existing legislation

The transposition of the Directive 2002/91/EC to the Spanish regulations will be accomplished through a set of three different Royal Decrees:

a) Royal Decree for the approval of the Building Technique Code (*Código Técnico de la Edificación - CTE*)

(REAL DECRETO 314/2006, de 17 de marzo, por el que se aprueba el Código Técnico de la Edificación.)

Under the responsibility of the Dwelling Ministry.

The Building Technique Code (*CTE*) is the transposition of the articles 4, 5 and 6 of the EC directive, related to the minimum requirements on the energy performance of new buildings and of large existing buildings. This document is divided into five sections:

- *HE 1*: Minimum requirements on the building energy demands.
- *HE 2*: Efficiency of the thermal equipments in buildings.
- *HE 3*: Energy efficiency of the lighting facilities.
- *HE 4*: Minimum solar energy contribution for sanitary heat water.
- *HE 5*: Minimum solar energy contribution for electric energy.

b) Royal Decree for the approval of the new Regulation of Thermal Equipments in Buildings (*Reglamento de Instalaciones Térmicas de los Edificios - RITE*)

Under the responsibility of the Industry Ministry.

The minimum requirements for the efficiency of thermal equipments in buildings, and the conditions for the regular inspections of boilers and of air-conditioning systems, will be accomplished by this document. Therefore, this is the transposition of parts of the articles 4, 5, 6, 9 and 10 of the EC directive.

c) Royal Decree for the approval of the Energy Certification of Buildings (*Certificación Energética de Edificios*).

(REAL DECRETO 47/2007, de 19 de enero, por el que se aprueba el Procedimiento básico para la certificación de eficiencia energética de edificios de nueva construcción.)

Under the responsibility of the Industry Ministry.

This Royal Decree is the transposition of the article 7 of the EC directive related to the energy certification of buildings.

The main objective of this Royal Decree is to establish the basic procedure of the calculation methodology for the energy efficiency rating. This procedure is

the start point of the energy certification of buildings, and it takes into account the main parameters affecting the energy consumption of new buildings and existing buildings for which a rehabilitation plan has been presented.

This document also establishes the administrative and technical conditions to get the energy certification of a certain building.

Finally, an energy efficiency label is approved and presented in the Royal Decree. This label is shown in figure 19, and is the one approved in the document CEN prEN 15217 “Energy performance of buildings: Methods for expressing energy performance and for energy certification of buildings”.

5.2 Realisation of the main issues

5.2.1 Article 3: Adoption of a methodology

The first section of the Building Technique Code (*HE 1 - CTE*) will replace the current Spanish regulation related to energy demands in buildings (*NBE-CT-79*). In order to fulfil this new regulation, two alternative options can be followed (see also Figure 1):

a) Simplified option

This option is based in the indirect control of the energy demands in buildings, through the limitation of the thermal characteristics of their components.

b) General option

This option is based in the assessment of the thermal building performance and its comparison with that of a reference building.

The assessment of the thermal building performance and the automatic generation of the reference buildings are carried out through the use of a software tool specially developed with this purpose (LIDER, see Figure 2).

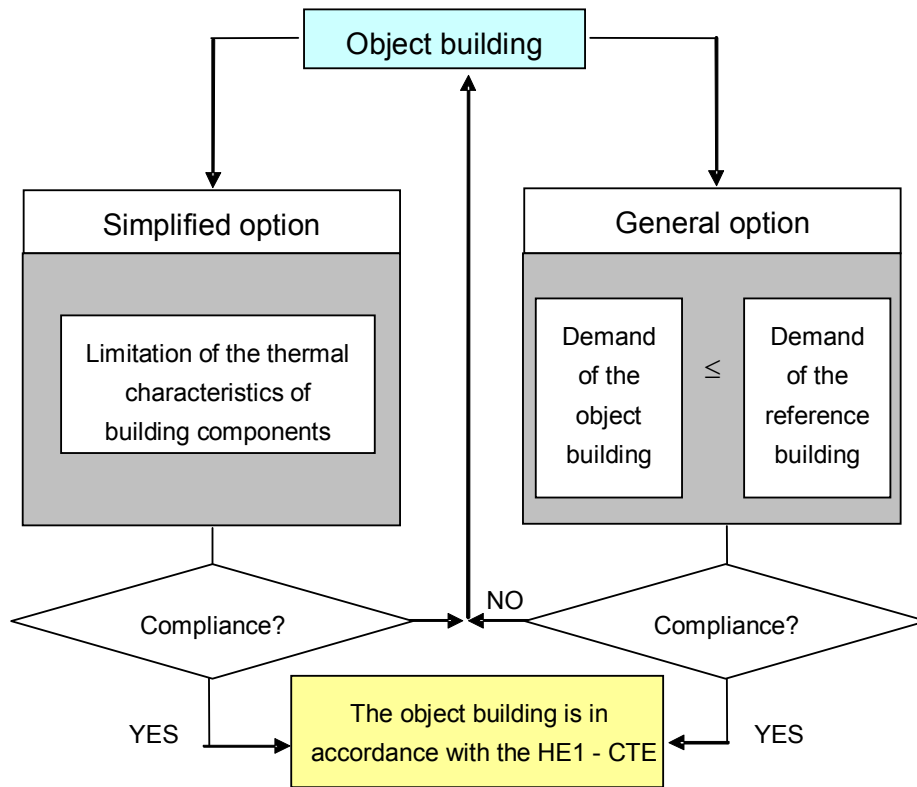


Figure 1: Scheme of the methodology calculation

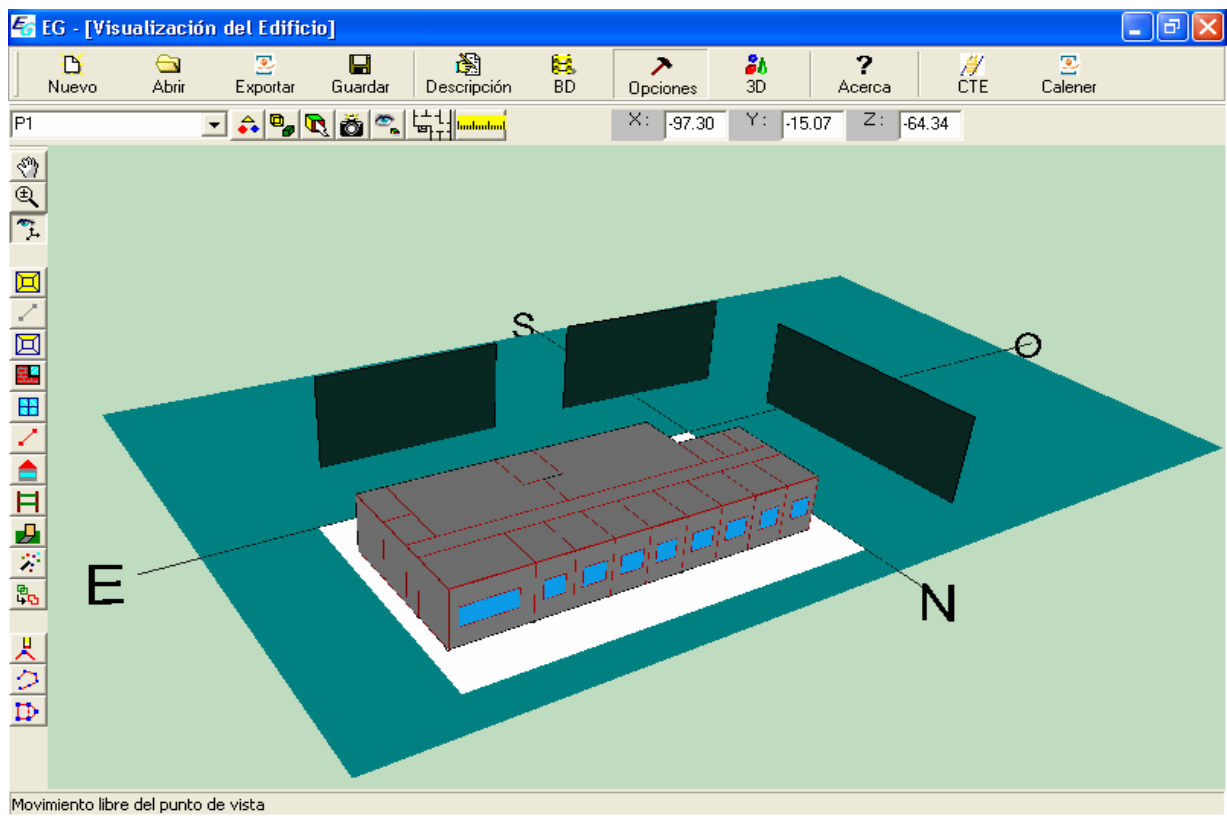


Figure 2: Screen of the LIDER software

5.2.2 Article 4, 5 and 6: Setting of energy performance requirements in new and existing buildings

All new buildings will have to fulfil the different sections of the Building Technique Code (*CTE*).

The same requirements will be applicable to existing buildings with a total surface area over 1000m², when they are renovated.

5.2.3 Article 7: Energy performance certificate

The energy certification of a building will be realised in two phases:

- a) a provisional energy certification in the design phase of the project, and
- b) a definitive energy certification in last process of the execution project.

In both cases, this energy certification will be realised with the following documentation:

- Description of the building thermal characteristics
- References to the current regulations
- Building energy rating
- Recommendations for the improvement of the energy efficiency

The rating process will be realised through the use of another software tool (CALENER, see Figure 3).

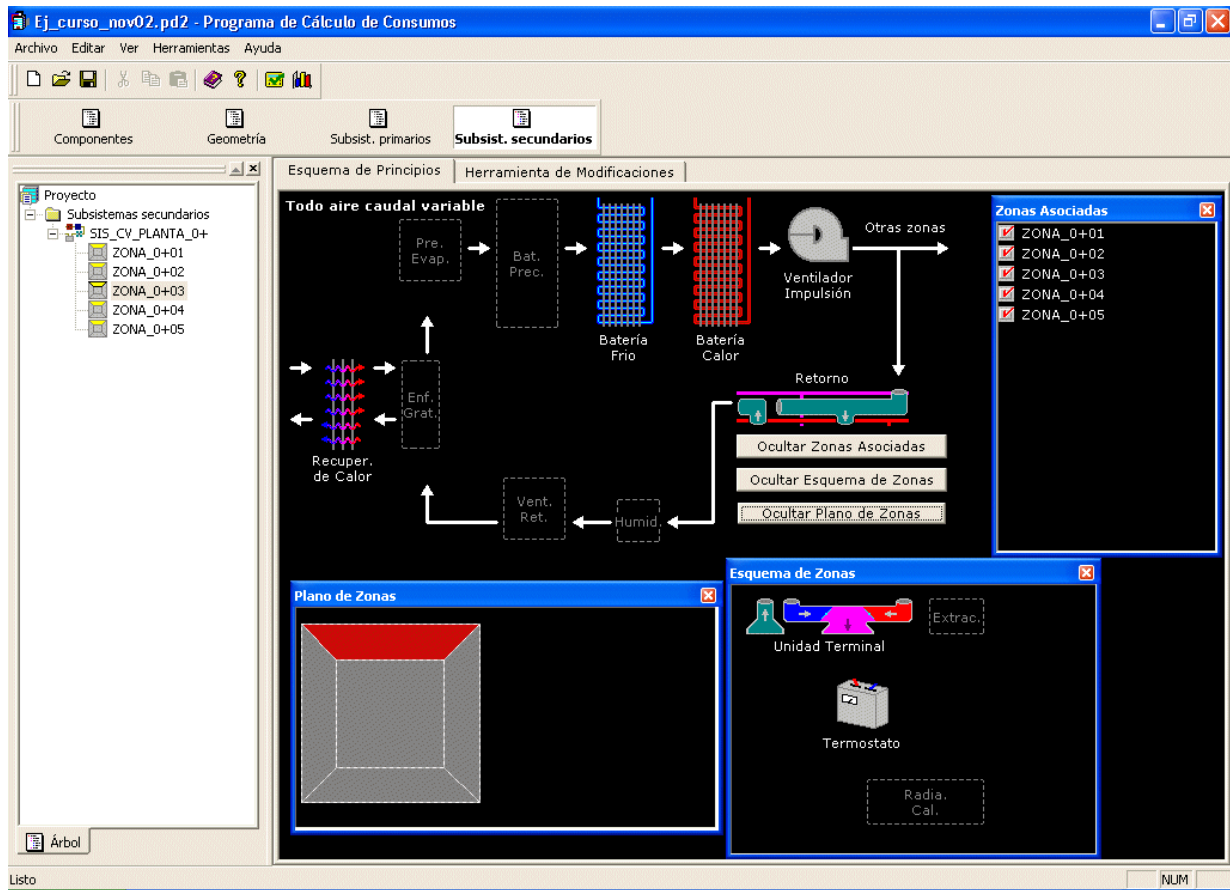
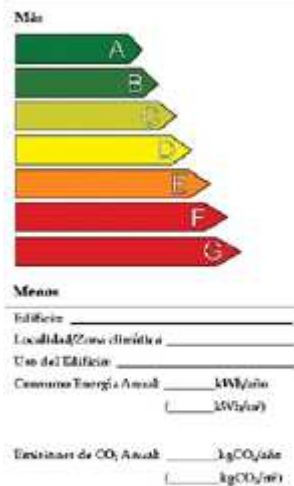


Figure 3: Screen of the CALENER software

Calificación de eficiencia energética de edificios
proyecto/edificio terminado



El Consumo de Energía y sus Emisiones de Dióxido de Carbono son las obtenidas por el Programa _____, pero en condiciones normales de funcionamiento y ocupación.

El Consumo real de Energía del Edificio y sus Emisiones de Dióxido de Carbono dependen de las condiciones de operación y funcionamiento del edificio y de las condiciones climáticas, entre otros factores.

Figure 19: Energy efficiency label for a new building

5.2.4 Article 8 and 9: Inspection of boilers and air-conditioning systems

The new Regulation of Thermal Equipments in Buildings (*RITE*) will establish the conditions for the regular inspections of boilers and of air-conditioning systems.

6 Report from Greece

6.1 Existing legislation

The implementation of the Directive 2002/91/EC will begin in Greece in January 2006. No further information or relevant national legislation is available till now concerning the EC Building Directive. The national legislation has not any requirements or even references to passive, hybrid or low energy systems.

6.2 Realisation of the main issues

The existing national legislation covers issues as:

- the minimum required insulation
- thermal comfort conditions
- indoor air quality limits
- requirements concerning the HVAC system
- requirements concerning the heating system
- proposed values of fresh air

The national legislation concerning the minimum required thermal insulation, the HVAC and heating systems have to be updated in order to meet the EC Building Directive. Also new legislation has to be enacted concerning natural and artificial lighting, requirements concerning passive, hybrid and low energy systems, the final energy consumption for heating, cooling, lighting and hot water and finally new calculation methodology that will take into account all the above parameters.

6.2.1 Article 3: Adoption of a methodology

A detailed methodology that fulfils the requirements of the European Union Directive has been proposed in the past. The methodology has been characterised as very complicated and rejected.

6.2.2 Article 4, 5 and 6: Setting of energy performance requirements in new and existing buildings

The energy performance requirements in buildings will be determined towards the energy performance of the existing building stock. A significant number of information concerning the energy consumption of building should be collected in order to determine the energy limits of the energy performance breakdown.

Since 2001, the Group of Building Environmental Studies is moving that direction, collecting data of energy consumption for the different building categories. The building categories are those that have been specified in the European Union Directive.

Also, Group of Building Environmental Studies is producing a software tool in order to estimate the energy performance of new buildings in accordance to the latest EN. The tool will be used in order to estimate the energy performance of the new buildings and give the relevant energy certification. Figures 11 and 12 show the interface of the software.

The screenshot shows the 'softenergy' software interface titled 'Energy Certification of Residential Buildings'. The interface is divided into several sections:

- Building Data:** Includes dropdown menus for 'Building Type', 'Insulation', and 'Choose location', and a text input field for 'Area (m2)'.
- Energy Data:** Features radio buttons for selecting between 'Annual Oil Consumption (l/yr)' and 'Net Annual Electricity Consumption (kWh/yr)', with corresponding text input fields and 'OR' labels. Below this, there are radio buttons for 'Cost of Annual Oil Consumption (€)' and 'Cost of Net Annual Electricity Consumption (€)', also with text input fields.
- Calculations:** Contains text input fields for 'Annual Heating Energy Consumption (kWh/yr)', 'Net Annual Electricity Consumption (kWh/yr)', 'Annual Heating Energy Consumption per unit area (kWh/m2yr)', and 'Net Annual Electricity Consumption per unit area (kWh/m2yr)'.
- Results:** A legend indicates 'Heating' (blue) and 'Electricity' (red). Below the legend are three empty bar chart areas: 'Energy Consumption', 'Cumulative Distribution for Heating', and 'Cumulative Distribution for Electricity'. To the left of these charts is a list of energy consumption metrics: 'Calculated (kWh/m2yr)', 'Passive Standard (kWh/m2yr)', 'Best Practice Building (kWh/m2yr)', 'Typical Value Building (kWh/m2yr)', 'Normalised Consumption (kWh/m2yr)', and 'Actual Consumption (kWh/m2yr)'. The x-axis for all charts is labeled 'kWh/m2yr'.
- Navigation:** A row of buttons at the bottom includes 'Main Menu', 'Results', 'Calculate', 'Get Energy Certificate', 'Energy Improvements', 'Reset', and 'Exit'.

Figure 4. Interface of the software

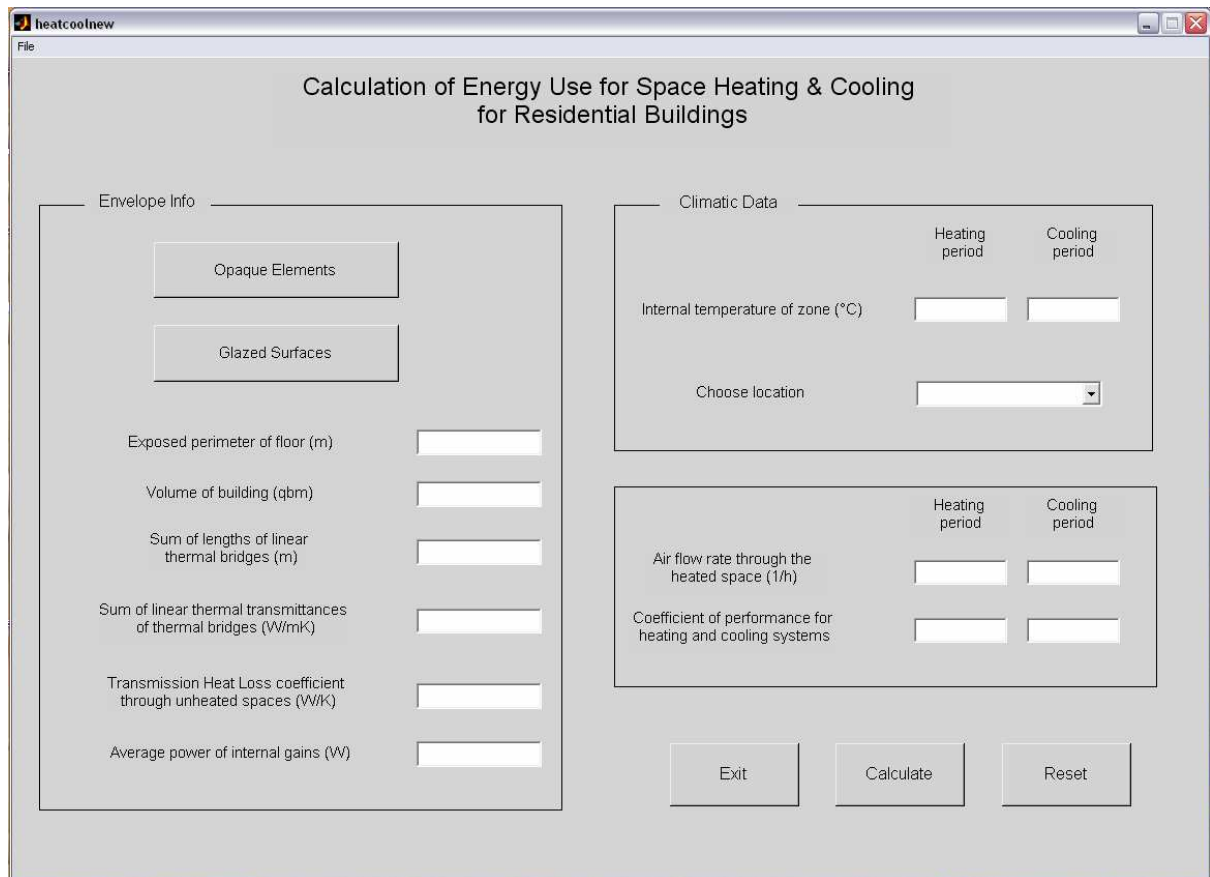


Figure 5. Interface of the software

6.2.3 Article 7: Energy performance certificate

The energy certificate will be given to new and existing buildings too. The certificate to new buildings will be given in accordance to their energy performance as it has been calculated by software. For existing buildings the certificate would be given after measurements.

6.2.4 Article 8 and 9: Inspection of boilers and air-conditioning systems

No preparation work on this articles has been done till now.

6.2.5 Article 10: Independent experts

No preparation work on this article has been done till now.

7 General conclusions

The individual country reports from Germany, Scotland, Spain and Greece confirm the great differences in progress and contents of the implementation of the EC Building Directive within Europe. While in Greece the introduction of the directive will start in January 2006, in Spain and the UK serious preparations for the adoption of the given requirements are conducted currently. In Germany several laws and orders containing elements of the EC Building Directive are valid already. In respect of the transposition deadline on 4 January 2006 (Article 15) the Member States will bring into force or complete numerous laws and regulations, which shall improve the energy performance of buildings. From the available country reports the following conclusions can be drawn:

- As there is no common methodology in the building sector in Europe the Member States shall establish their own methodology at a national or regional level (Article 3). The precise formulation of a common terminology in standards, norms or decrees can be helpful but is not binding. The development of consistent calculation tools for the determination of energy consumptions or balances – preferably as software or manual – is probably the most effective way to comparable results.
- The requirements given in Article 4, 5 and 6 will lead to a classification of buildings according to their energy consumption as it is accomplished in Germany already. Here the buildings are subdivided according to their energy consumption per floor area (kWh/m²), which consequently is a criteria for price formation, too.
- The claim that existing buildings with a floor area larger than 1000 m² have to comply with the new regulations when they undergo "major" renovations is still unprecise (Article 6). For the national implementation of the EC directive a concrete definition of the term "major renovation" is desirable. This can be done e.g. by the setup of a threshold value, which specifies the renovation costs in relation to the total value of the building.
- Regarding the availability of energy certificates (Article 7) the development seems to be rather advanced in Germany where 4100 energy passes were issued within a field test. The success of these activities shows that the certificates were accepted by the building players and that they are a useful method to promote energy saving measures. Furthermore they are a reasonable motor for pricing mechanisms related to lower energy consumptions of buildings. The Member States shall advertise the advantages of certificates by PR activities.
- In consequence of the energy pass availabilities in Germany the training of individual experts (Article 10) is currently accomplished. It is conducted by designated institutions or companies with defined contents and training hours. In contrast, in Spain, Scotland and Greece the conditions of expert training still have to be implemented, but they are in the planning phase. In order to guarantee a

rapid commencement of their tasks the experts shall be recruited from professionals of the building sector, which have a certain pre-knowledge already.