Energy Certification of Buildings Training of Experts

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Abstract: According to the Action plan of the Ministry of Environmental Protection, Physical Planning and Construction, the engagement of the implementation of the Directive 2002/91/EC to the Croatian legislation has to be completed in 2009. The final goal of the Directive is the achievement of energy efficiency in buildings, with emphasis on design of building and building elements, heating and cooling systems and use of renewable energy sources. The presentation of energy performances of the building should be visible in energy label that will classify the building in comparison to energy consumption and must be submitted while buying, selling or renting the building. For the realization of energy certification of the building it is required to provide training for wide number of experts. The production of professional basis is ongoing, where besides the building classification and modification or production of correspondingly technical regulations, are determining the conditions and standards for persons who should provide the certification, as well the method of providing.

Key words: Buildings, energy consumption, certification, training of experts.

1. Introduction

A large number of countries and organisations launched worldwide programs and network of activities for promotion and education as well as for the implementation of energy efficiency measures in order to ensure high level of environmental protection and sustainable development. Energy production and consumption are the indicators of economic and technological development level but are also the most significant factor in environmental pollution. The constant increase in energy prices prompts the expeditious implementation of measures for energy use reduction as well as the finding and the exploitation of alternative energy sources.

2. Energy Consumption in Building Construction

The substantial improvement of living standard and life style changes leads to higher energy consumption due to the wide-spread use of air conditioning for space cooling. The use of air conditioning causes considerable environmental pollution exacerbating, thus, already intense global warming which, on the other hand, has a significant impact on further increased energy consumption in order to maintain the acquired standard of living. Buildings consume significant amounts of energy participating in the total annual energy consumption with almost 40%.

The possibilities of energy saving are the largest in the building construction sector. The present measures for heat loss reduction through building components and their related joints resulted in the considerable progress in energy efficiency but not all possibilities have yet been exhausted. The biggest share in current energy consumption goes to space heating (52% in non-residential sector and 54% in residential sector). The energy consumption shares for lighting installations and hot water supply must not also be overlooked.

The present calculation method focused on the heat necessary for space heating in buildings was based solely on the construction part of the building without taking into consideration the efficiency impact of heating, air-conditioning and ventilation systems and does not present the actual energy consumption. Extraordinary energy savings potential lies in the
building sector, i.e., up 22% by 2010, especially in heating installations, hot water supply, air conditioning and lighting installation.

3. European Initiatives


The most important document currently in implementation in all EU Member States is Directive 2002/91/EC on the energy performance of buildings passed by the European Parliament and of the Council on 16 December 2002. The four key points of the Directive are a common methodology for calculating the integrated energy performance of buildings; minimum standards on the energy performance of new buildings and existing buildings that are subject to major renovation; systems for the energy certification of new and existing buildings and, for public buildings; energy performance certification, inspection and assessment of heating installations and central air-conditioning systems in buildings.

According to Article 3 of the Directive the methodology of calculation of energy performances of buildings shall include at least the following aspects: thermal characteristics of the building (shell and internal partitions, etc.), heating installation and hot water supply, air-conditioning installation, ventilation, built-in lighting installation, position and orientation of buildings, including outdoor climate, passive solar systems and solar protection, natural ventilation and indoor climatic conditions. The positive influence of the renewable energy sources shall, where relevant in this calculation, be also taken into account.

For the purpose of this calculation buildings should be adequately classified into categories such as single-family houses of different types; apartment blocks; offices; education buildings; hospitals; hotels and restaurants; sports facilities; wholesale and retail trade services buildings; other types of energy-consuming buildings.

The deadline for the transposition of Directive 2002/91/EC by EU Member States was January 4, 2006 but the implementation was in practice postponed for up to three years (January 4, 2009) and almost all Member States took advantage of this opportunity to delay its implementation.

Due to the upcoming expiry of the EPBD implementation deadline which has been postponed for three years the final preparations for full implementation of the legislative framework regarding energy efficiency in buildings are well underway.

EPBD implementation process is an extremely complex and multidisciplinary task which poses significant challenges for the Member States and requires the engagement of numerous accredited institutions and experts in its realisation. In order to facilitate the implementation of the Directive several international initiatives were launched. One of the main initiatives for promoting dialogue between the Member States is the Concerted Action (CA) in which Croatia also participates, has two main objectives: enhance and structure sharing of information and experience from national implementation as well as promote good practice in activities required of Member States for implementation of the Energy Performance of Buildings Directive (EPBD). The first Concerted
Action (CA I) initiative and its continuation (CA II) assist in addressing the issues in implementation of Directive provisions and finding the most suitable methodology. The exchange of information during the project duration shows full cooperation between the participants and mutual readiness for professional assistance.

4. Energy Efficiency Legislation in Croatia

Even though the mentioned Energy Performance of Buildings Directive has not been fully transposed in Croatian, the preparatory activities have been underway for several years in Croatia and energy efficiency standards have been included in a series of laws, ordinances and regulations. In the area of thermal protection and energy saving in buildings numerous European standards were accepted which are the integral parts of methods for thermal performance calculations for buildings. A number of national technical regulations refer to the calculation methodology according to European standardization system accepted also in Croatia.

The Republic of Croatia is interested to remove the barriers to efficient energy use, the cogeneration implementation and the use of renewable energy sources which is clearly visible in its strategic documents such as the Energy Development Strategy (OG No. 38/02) and the National Environmental Strategy (OG No. 46/02) as well as the Energy Act (OG No. 68/01 and OG No. 177/04).

There are several acts, regulations and ordinances that have been already enacted and are partly connected with the EU Directives such as the Construction Act (OG No. 175/03 and 100/04) with provisions setting the requirement for thermal energy saving and thermal protection which was taken from the Construction Products Directive 89/106/EEC. Pursuant to this act Technical Regulation on Thermal Energy Saving and Thermal Protection of Buildings (OG No. 79/05, 155/05 and 74/06) and Technical Regulation on Systems for Ventilation, Partial Air Conditioning and Air Conditioning of Buildings (OG No. 03/07) as well as the Technical Regulation for Door and Windows (OG No. 69/06) and the Ordinance on Conformity Assessment, Conformity Certificates and Marking of Construction products (OG No. 1/05).

Technical Regulation on Thermal Energy Savings and Thermal Protection of Buildings (OG No. 79/05, 155/05 and 74/06), which took effect in 2005, introduced new calculation method for energy performance denoted as $Q_h$ or the annual thermal heat demand necessary for the heating of the building (in kWh/m² for residential buildings or in kWh/m³ for non-residential buildings). In order to successfully apply this calculation method the experts developed some supporting computer programmes. In the past three years all initial difficulties in the implementation of this regulation have been completely overcome creating, thus, the basis for the regulation emendation according to European trends and successful increase of energy efficiency.

5. Transposition of EPBD in Croatian Legislation


In early 2007 the Commission for implementation of European Directive 2002/91/EC has been founded within the Ministry of Environmental Protection, Physical Planning and Construction. Its members are the experts from various ministries, faculties, institutes and economy. The task of the Commission was to develop the action plan for the implementation of Directive. In March 2008 Croatian Government adopted the EPBD Implementation Plan which anticipates the following activities:

- transposition into laws and sub-law acts which regulate the construction as well as energy and energy efficiency sectors,
• implementation through sub-law acts by taking over all relevant standards, procedure development, certification of new and existing buildings, education programs for accredited energy experts,
• other technical measures essential for development: implementation assessment of alternative energy supply systems, energy efficiency of boilers, heating and air conditioning systems, system audit, setting up of administrative framework, making of national data base, promotion of energy efficiency in building construction and marketing.

At the moment the analyses of the EPBD implementation experience in European legislation are underway and the expert base studies are being prepared to facilitate the making of draft versions of regulations and ordinances which will regulate the Croatian legislation framework in the area of energy efficiency according to new methodology.

Until the end of 2008 the following regulations will be enacted:
• Technical Regulation on Heating and Cooling of Buildings,
• Revised Technical Regulation on Thermal Energy Saving and Thermal Protection of Buildings,
• Ordinance on Classification of Buildings, Buildings with Obligatory Energy Performance Certificate Display and Certification Process,
• Ordinance on Terms and Criteria for Selection of Energy Experts.

It is anticipated that the drafting of the suggestions for energy inspections for both new and existing buildings, reference books and computer software necessary for certification process and the revision of computer programmes for calculation of energy performance of the building according to adopted methodology will be completed in 2009.


Pursuant to Article 7 of the Directive the energy performance certificate must be issued for all buildings displaying the data on energy characteristics and the energy efficiency scale of the each building. The energy performance certificate for buildings shall include reference values such as current legal standards and benchmarks in order to make it possible for consumers to compare and assess the energy performance of the building. The objective of the certificates shall be limited to the provision of information and any effects of these certificates in terms of legal proceedings or otherwise shall be decided in accordance with national rules.

The provision of the energy performance certificate will be obligatory for all new buildings, major renovations of existing buildings and for the existing buildings when sold or rented out. The validity of the certificate must not exceed 10 years. The energy performance certificate for buildings with a total useful floor area over 1000 m², occupied by public authorities and by institutions providing public services to a large number of persons and therefore frequently visited by these persons, must be placed in a prominent place clearly visible to the public.

Energy performance certificates will significantly influence both the real estate market and the status of dwellings their owners want to sell or lease.

The prospective sellers or landlords will have to provide the certificate on energy performance scale (A to G) for its real estates and made it available to the prospective buyer or tenant, as the case might be. The Energy performance Certificate will bring more transparency to the real estate market and raise consciousness of all market participants about the energy performance. A higher energy rating should make a better rated building more marketable than one with a lower rating. The owners will, therefore, be motivated to point that out as an extra positive selling factor. This should encourage the owners whose real estate has lower energy rating to make necessary improvements in order to achieve higher energy efficiency rating (Figs. 1–2).
Fig. 1 Examples of the energy performance certificate for buildings (Ireland, Portugal and Italy).

It is expected that the investment in energy efficiency of buildings will be cost-effective both for the owners and the tenants in the form of the provided comfort, lower running costs and increased market value of the property. The market trends and behaviour of market participants will change in time which will, undoubtedly, improve the energy efficiency of national housing stock in general. The mentioned market changes will considerably contribute to the environment protection through CO₂ reduction in national housing stock.
7. Training of Energy Experts and Inspectors

Large number of accredited experts and inspectors must be trained for assessment of energy performance of buildings and issuing of energy performance certificates. The energy performance certificate for new buildings can be made as a part of technical documentation on the basis of the project data and the assessment of the building components performance as well as the properties of built-in devices. The certification for the existing buildings will be based on the analysis of the building components, built-in devices and the building’s geometry. It is necessary, thus, to conceive and conduct adequate professional training courses.

During their training courses the energy experts will acquire a variety of information about the EPBD provisions, building rating, demands, methods of energy assessment, the measurements of the building’s dimensions, calculations: the U-value, heat and ventilation losses; energy assessments of heating and cooling systems as well as the systems for hot water supply; lighting installations, renewable energy sources, carbon dioxide emission calculations. In order to be able to use the computer programmes the experts must be also computer literate.

The experiences in the conducting of the training courses for energy experts and inspectors in the Member States of European Union show that the continuity is very important in order to train sufficient number of adequately trained experts as soon as possible. The training courses in Ireland show the complexity of the task and the scope of activities that are still impending in Croatia. In Ireland weekly training courses are conducted at 26 locations (May – June 2008 data). The workshop-type training course for
maximum 10 participants lasts five days (40 hours). Its registration and participation fee is 1,800 Euros. The training courses are followed by exams on national level. For a successful energy performance certification of almost 170,000 buildings, there will be a need for up to 2,000 independent experts and inspectors to deal with the demand. In Denmark the energy experts must renew their licences on annual basis. In addition to that, all experts and inspectors have to follow a yearly one-day training course on experience from the quality control, reported energy labelling and technical research and development.

8. Conclusion

The emendation in technical regulations in the area of energy efficiency has a considerable influence on building design. The architects must take into consideration all aspects of energy saving regarding the heating, cooling, ventilation, lighting and other energy flows. New dimension has, thus, been added to the preparation of technical documentation for energy efficiency while the cooperation with the experts in the area of building physics, mechanical engineering and electrical engineering is indispensable and very important. The energy performance certificate will provide energy ratings for buildings according to their energy consumption which will also be an important indicator of the building’s utilisation expenses. This document will significantly change the relations towards the real estate value, particularly with regard to the existing residential buildings, because higher energy rating will also be a positive factor when selling the building. The efforts of Croatian professional builders in implementation of energy performance certification will be rewarded with the setting up of energy efficiency in building construction as an essential determinant of sustainable development.

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