Intelligent Energy Europe
EIE-2003-096

Newsletter

11, February 2007

Applying the EPBD to improve the Energy Performance Requirements to Existing Buildings – **ENPER-EXIST**

Content:

Announcements workshops conferences etc.

PALENC/AIVC – Building low energy cooling and advanced ventilation technologies in the 21st century, Crete island, Greece, 27-29/9/2007
for further information see: http://palenc2007.conferences.gr/

WORKSHOP "Energieeffiziente Schulsanierung" (*Energy Efficient Retrofit of Schools*), Stuttgart, Germany, 9/3/2007
for further information see: http://www.ibp.fhg.de/veranstaltungen/Programm_Workshop_EnEff_Schule_9_3_07.pdf

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ENPER-EXIST Project Results: Building stock knowledge

Purpose of the work

The purpose of ENPER-EXIST WP3 is to provide information on the level of building stock knowledge and to collect available data on a broad basis. Furthermore to analyse how decisions for energy improvements are based on this information and to make recommendations on how to improve the knowledge by using certification schemes.

Level of information available

Information on available data regarding the existing building stock in each member state has been obtained from project partners and also with help from industry through their marketing investigations. A pre-questionnaire was circulated to the participants aiming at finding the level of available information and to indicate its sources and quality.

In general more information is available for the residential sector compared with the non-residential sector. But in the case of electricity consumption, there is more information available for the non-residential sector. Some countries like Denmark have a lot of information mainly because they have had a mandatory certification scheme since 1997.

The information selected has been gathered in an EXCEL-file, an electronic "tool", so it is possible to make illustrative graphs, update easily, make new worksheets etc. The second step was to collect some of the available information about:

- Energy consumption for heating and ventilation
- Results from national projects concerning estimated energy savings potential
- Relevant www-sources from each country concerning building stock knowledge
- Results and information from other EU/IEA projects concerning building stock knowledge and energy savings potential
- Results from national investigations of 1) what data decisions made are based on regarding building regulations and 2) which data decision-makers are missing.

Knowledge about the existing building stock is available at both national and European levels. The most detailed knowledge is of course compiled in national statistics. Additional knowledge is found in separate databases in connection with specific EU projects, work packages or others sources. For example in the EPA-NR project, a large investigation concerning the non-residential sector has been made and the main results have been included in the ENPER-EXIST report. Concerning European Statistics both Eurostat and The European Environment Agency are in possession of statistics for buildings.

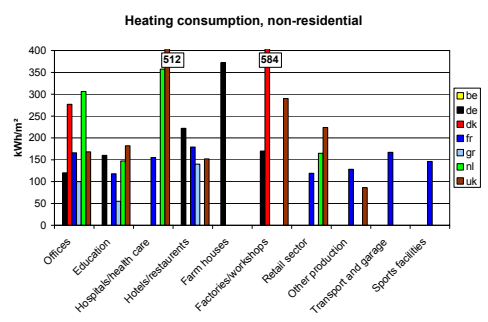

figure: Energy consumption for space heating in non-residential buildings in the ENPER-EXIST countries

Potential for heating savings

A comprehensive investigation based on data from the Danish certification scheme was carried out in order to obtain knowledge about the potential for heating savings in dwellings. Apart from energy considerations, an evaluation of the economic consequences is given for the most profitable energy saving measures. Based on these results, a table has been set up listing a minimum set of information to be recorded in the new European certification schemes.

Improved building stock knowledge

Until now, only few European certification schemes have been launched. Still, it is possible to call attention to elements that must be considered with regard to schemes on the drawing board and existing schemes have been that

ENPER-EXIST Project Results: Building stock knowledge (cont.)

should be adjusted. Only this way knowledge concerning energy consumption, energy savings and evaluation of energy saving potential can be improved.

Reporting forms and the functionality of computer programs can be crucial for the quality of knowledge obtained and these must be planned with great forethought. Likewise, the education, qualifications and appointment of practising energy consultants as well as their access to high-quality, basic knowledge can be vital for the quality of knowledge embedded in the resulting energy certificate. Control of the work of the energy consultant will influence the refinement of the energy certificate. When focus is on data collection, another important question is whether knowledge about the energy efficiency of buildings should be due to meters reading or calculation.

Results

A draft final report has been written gathering all the information collected. In this, pro and contra for possible measures to improve the building stock knowledge are listed.

The EXCEL-tool and the report are placed as draft final versions at the ENPER-EXIST web page http://www.enper-exist.com/results.html and comments are very welcome.

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ENPER-EXIST Project Results: Tools application

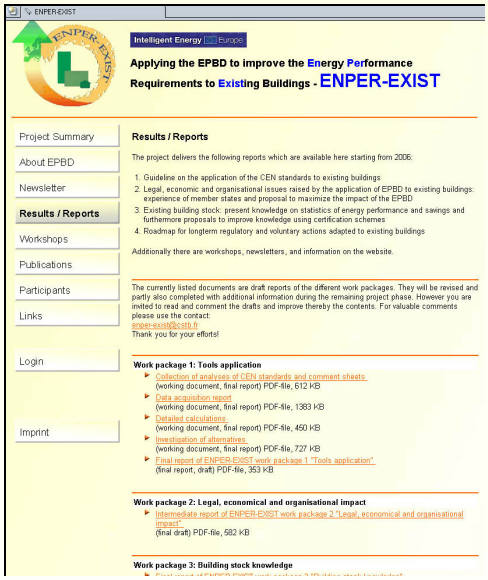
There are several reasons why the assessment of energy use for existing buildings cannot be totally the same as the assessment of energy use for new buildings. For starters the goal of the assessment is different: The calculation procedures are needed in the context of different EPBD requirements and these different EPBD requirements have different objectives and therefore demand different boundary conditions. Partly this has to do with legal issues, but also other aspects are involved. Secondly the energy use in buildings changes when buildings become more energy efficient, but not every contributor to this energy use changes in the same proportion to all the others. This creates a shift in energy uses which needs more attention. And last but not least, a key issue is the input data and the data acquisition. The level of information available for the assessment is different and the way information is gathered (the data acquisition) is different as well. So a focus on the assessment of energy use for new buildings results in gaps for the usability of the method for existing buildings.

The CEN working groups have done a tremendous job to deliver a huge amount of EPBD CEN standards to guide the implementation of the EPBD in the member states. But because of lack of time and priority it has been inevitable that most of the working groups have had more focus on new than on existing buildings. ENPER-EXIST has jumped into this gap and has provided assistance to the EPBD CEN standards within the task “Tools application”.

Within the task various courses have been taken to provide this assistance:

1. The expert knowledge of the participants of the project is used to analyse the most important CEN standards. This has been a desk research.
2. The usability of the CEN standards on existing buildings has also been tested in practice in a pilot test which focussed on the gathering of the input data.
3. The third practical test has been the performance of some detailed calculations with the CEN standards.
4. The knowledge of the developers of existing EP methods for existing buildings (on national level and on EU level) is used to find alternative solutions for gaps which were found during the project.

The results of these four courses have been documented in the four working documents which belong to this study on the applicability of EPBD CEN methods on existing buildings. The reports can be found on www.enper-exist.com/results.html under “Work package 1: Tools application”.



In short, the results of the four studies are described below:

1. We started the work in this task by analysing the most important EPBD CEN standards, covering the topics space heating and cooling, ventilation, domestic hot water, combustion systems and lighting. The study resulted in technical comments which were directly sent to the working groups of CEN, so they could make the suggested changes in the CEN EPBD standards. Typical comments concerned:

ENPER-EXIST Project Results: Tools application (cont.)

- making default values for various input parameters which are hard to gather in practice, e.g. typical values for internal heat sources, infiltration and ventilation rates;
- simplifications of certain aspects of the calculation, e.g. concerning thermal bridges, sunspaces and solar shading;
- adding aspects of aging to the methodology, e.g. for glazing;
- development of simple tables to replace and in this way simplify parts of the calculation method.

2. The next topic in the task was to test the CEN standards in practice. This has been tested via a pilot study, which was focussed on installation standards. The usability differs from standard to standard. Some parts, like the tabulated method for space heating distribution and the tap requirements for hot water appear to be usable. The typology method to determine the space heating generation of combustion systems is an example of a method which is very suitable to be used as the bases for the development of a tabulated method. Some methods are usable in existing buildings with some simplifications or improvements: so does the addition of some defaults within the quick method for lighting make this method very easy to use in existing buildings. And the development of a method based on ventilation profiles appears to be necessary to make the calculation method for the energy use for ventilation easy to use.

3. The third practical test has been the performance of some detailed calculations with the CEN standards. Together with the pilot study on data acquisition this is the ultimate test of the usability of the standards in practice. In the scope of this study, calculations are performed related to the hourly heating and cooling need, the ventilation flow, energy use for lighting and the generation efficiency of boilers. The results differ per standard:

- Calculation of energy use for space heating and cooling using the hourly calculation method (ISO/DIS 13790) can be used to existing building only in the case the inspection of the buildings allows to gather the most important necessary data or default values are available. More guidance to define default values according to the observations will make the method more useful.
- For existing buildings the liability of the EP calculation increases when standard conditions for the ventilation flow are used, instead of using the calculation of ventilation air flow supply according prEN 15242.
- The simple lighting method (prEN 15193) in general represents a good framework for a quick estimation procedure. Nevertheless the default values as currently contained in prEN 15193 seem to be not suited to provide realistic and reliable lighting energy demands. A more detailed and refined set of default parameters might in future provide more realistic scenarios.
- Regarding the generation efficiency of boilers, this study shows that it is possible to use the case specific method to develop a table method for the efficiency of boilers for existing buildings.

4. Finally, the knowledge of the developers of existing EP methods for existing buildings (on national level and on EU level) has been used to find alternative solutions for gaps which were found during the project. These solutions often are a compromise: there are almost always pros and cons to the different approaches. The result contains a wealth of experiences and suggestions how to solve possible problems with the assessment of energy use for existing buildings.

The main issues which have been addressed are alternative methods when input data is not available, alternative methods when input data is available but it will take too much time to gather all the details and alternative methods when the situation typical for existing buildings are not addressed by the calculation method for new buildings.

Most alternative methods describe a way to simplify the method and with this reduce the amount of input data. Often the introduction of default values or tables is suggested. The main advantage is that the method is easier usable in practice; the main disadvantage is the loss of accuracy.

The disadvantage of losing accuracy can be discussed. Incorrect measurements or observations are also a potential source of large errors. Using more detailed input data introduces the appearance of accuracy, but it can be questioned if this accuracy is met in practice. Less input means less accurate results, but also less measurement and observation errors. It is important to realise that there is an optimum between these two.

Because a lot of problems with the assessment of energy use of existing buildings have already been addressed we recommend the developers of EP tools for existing buildings (CEN experts and national experts) to take into account this existing experience. The risk of not using this experience is that the methods will become too academic or, by trying to avoid this, too simple. By running case studies this risk can be reduced.

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EPA-NR software passes BESTEST

EPA-NR method and tools

EPA-NR provides an assessment method for the Energy Performance Certificate according to the Energy Performance of Buildings Directive (EPBD). The EPA-NR method consists of an energy calculation model and process supporting tools like inspection protocols, checklists and building component libraries. The EPA-NR method produces an Energy Performance Certificate for non-residential buildings with the possibility for additional advice.

EPA-NR calculation software (ENRtool)

In December 2006 the first version of the EPA-NR software (ENRtool) became available for testing in pilot projects. The results of the pilot projects will be used to update ENRtool (if necessary). For the BesTest ENRTool version 1.7.2.1 has been used. The calculation method (Soethout et al., 2006) of the ENRtool (Wittchen & Grau, 2007), developed in the EPA-NR project is based on several available sources. The most important source of information consists of the emerging CEN standards. Wherever these standards are not available or are leading to more complexity than desirable for energy performance calculations, other sources have been used, like EPA-ED (Berben, 2004) and national developments, like the Dutch EPA-U (Berben et al, 2004).

The calculation method in ENRtool is based on a monthly quasi stationary method where space heating and cooling is calculated from the building model exposed to monthly average values for the standard climate, valid for the region where the building is located.

Testing of ENRtool against the BESTEST

The BesTest (Judkoff & Neymark, 1995) is an International Energy Agency (IEA) project. In this project a method was developed for systematically testing whole building energy simulation programs and diagnosing the sources of predictive disagreement. The final report contains results of eight state-of-the-art software tools available in the United States and Europe for various test cases each addressing a specific energy transport phenomenon.

The building used in the BesTest case is a simple shoe-box shaped building without any real systems for maintaining the indoor climate and without much resemblance with a real building. The energy consumption for space heating and cooling is thus energy demands, as the efficiency of the systems is not taken into account.

Comparison of results from a simple tool like the ENRtool using monthly quasi stationary calculations with sophisticated, dynamic simulation tools as used in the BesTest comparison procedure is not a trivial task. Taken that into account, it was decided to run a limited number of BesTest cases (600-640 and 900-940) for the Denver climate. These cases were selected because of their nature, making it possible to do a reasonable comparison with the ENRtool (Wittchen, 2007).

Results

An example of the results for the heavyweight building (case 900) regarding annual heating and cooling demand calculated by the ENRtool and the dynamic simulation tools that were part of the original BesTest performed by IEA are shown in the figures below. Heating demand is shown in red colours and cooling demands in blue colours. Results from the ENRtool are shown as a green bar. The two horizontal lines in each graph indicate the 95 % confidence interval based on the results of the eight tools in the original BesTest project. There is thus a 95 % probability that the “true” value is between this upper and lower limit.

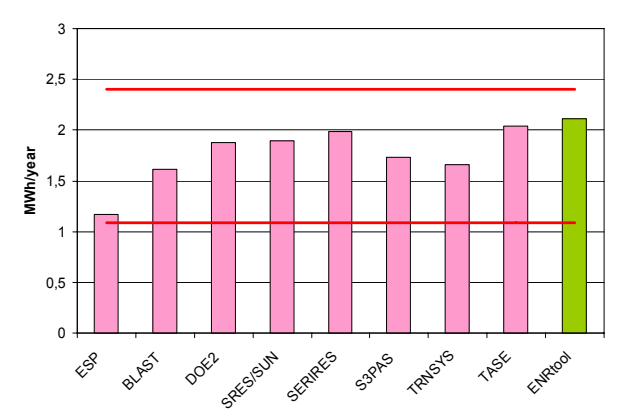

figure: Annual heating demand in case 900.

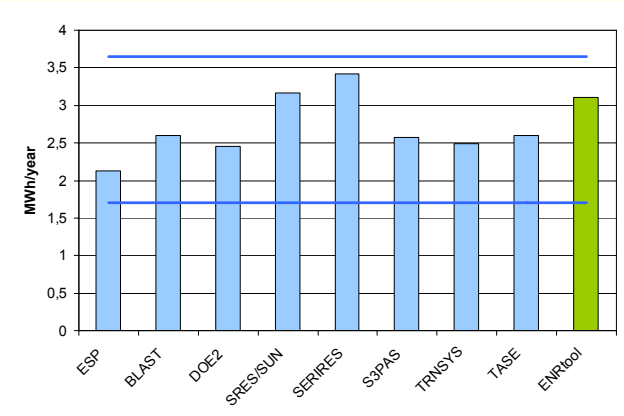

figure: Annual cooling demand in case 900.

Conclusions

For all selected examples results from ENRtool are within the acceptable limits from the results found by the tools in the BesTest. In general ENRtool performs well when compared to much more sophisticated, dynamic simulation tools, which are capable of taking into account all the given conditions of the climate and the building model. The calculated annual heating and cooling demand in the test buildings is as accurate by the ENRtool as by the dynamic simulation tool in the BesTest.

More information on EPA-NR

For more information on the EPA-NR project please visit www.epa-nr.org. All deliverables will be downloadable here once they have been approved by the consortium.

EPA-NR software passes BESTEST (cont.)

The partners participating in EPA-NR are: Arsenal and ÖÖI from Austria, SBi from Denmark, CSTB from France, Fraunhofer IBP from Germany, NOA from Greece, ENEA from Italy and TNO and EBM-consult from the Netherlands. The EPA-NR project is funded by the European Commission in the EIE-programme (contract no. EIE/04/125/S07.38651).

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Invitation to the PALENC/AIVC 2007 conference

The joint 2nd Palenc and the 28th AIVC Conference aims to focus on the advanced low energy cooling and ventilation technologies for buildings. Increase of the living standards, deterioration of the thermal conditions in the urban environment and non-appropriate architecture design, has caused huge penetration of air conditioning in many parts of the world and not only in hot climates. Such a condition has a very serious impact on the peak electricity demand of the countries and the corresponding energy consumption. Intensive research carried out during the last years has permitted to develop new technologies, components, materials and techniques that permit to decrease seriously or even eliminate the cooling demand of buildings. In parallel, very low energy consumption for cooling new generation buildings have been realized and monitored. Ventilation in buildings permits to decrease the cooling demand, improve comfort conditions and decrease indoor pollution.

A wide range of research activities carried out over the last years has permitted to develop advanced ventilation systems that highly satisfy the above requirements. There is in many countries increased interest in regulations to cover the issue of summer comfort, air conditioning and peak power control, e.g. the European Energy Performance of Buildings Directive asks from the Member States to undertake all the necessary measures in order to decrease the energy consumption caused by air conditioning and improve indoor environmental conditions (air quality, summer comfort,..). Passive and low energy cooling strategies provide interesting options. The scope of this Conference includes all aspects of technology and building design dealing with ventilation and passive cooling techniques able to improve the environmental performance of buildings. Papers related on ventilation, solar control, thermal mass, thermal comfort, urban microclimate landscaping, low energy, solar control, thermal mass, thermal comfort, urban microclimate landscaping, low energy architecture, innovative components and materials, standardization and legislation, advanced and alternative air conditioners, demand side management, etc. are welcomed. The main aims are to present and discuss the state of the art of research and applications dealing with ventilation and cooling and also to assess the results achieved almost two years after the application of the European Energy Performance of Buildings Directive.

Topics:
- Passive Cooling Techniques
- Ventilation for Cooling
- Solar Control
- Thermal Mass
- Natural Ventilation
- Hybrid Ventilation
- Heat Protection Techniques
- Advanced Control Systems and Techniques
- Innovative Material and Components
- Ground Cooling, Evaporative Cooling, Radiative Cooling
- Microclimate
- Heat Island
- Canyon Effect
- Applications in social housing
- Demand Side Management
- Legislation and in particular results from the application of the European Directive
- Education & distance learning
- Climatic Responsive Architecture
- Thermal Comfort
- Indoor Environmental Quality
- High Efficiency Air Conditioners

Date of the conference:
27-29 September, 2007

Venue:
The Conference will take place at Aldemar Knossos Royal Village, Limenas Hersonissou, Crete, Greece.

Call for papers:
330 submitted abstracts from 44 countries!

Important deadlines:
Notification for paper acceptance: 15 March 2007
Final papers due: 31 May 2007

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German Workshop on Energy Efficient Retrofits of Schools

On March 9, 2007 the Fraunhofer Institute of Building Physics, Projektträger Jülich and the German Ministry for Economy and Technology will organise a workshop on the energy efficient retrofit of schools buildings. Speakers from the ministry, research, communities, promotional organisations and

WORKSHOP
„Energieeffiziente Schulsanierung"

Disclaimer:

ENPER-EXIST has received funding from the Community's Intelligent Energy Europe programme under the contract EIE/04/096/S07.38645

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Please visit also the website of ENPER-EXIST:
www.enper-exist.com

German Workshop on Energy Efficient Retrofits of Schools (cont.)

the industry will present the state of the art, results from earlier projects and planned next steps. The workshop is part of a comprehensive project on schools retrofits that will have as highlight a so-called plus energy building, that means a school that will be retrofitted to producing more energy than consuming over the year. Other demonstration buildings will have the aim of using less than the equivalent of 3 litres oil for heating. Economical retrofits will be analysed as best practice examples, design guidelines will be developed on the basis of all type of demonstration buildings and a platform "life science centre EnEff Schule" will be started. The whole project is organised within the framework of the high tech strategy of the federal government.

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further information:
http://www.ibp.fhg.de/veranstaltungen/Programm_Workshop_EnEff_Schule_9_3_07.pdf

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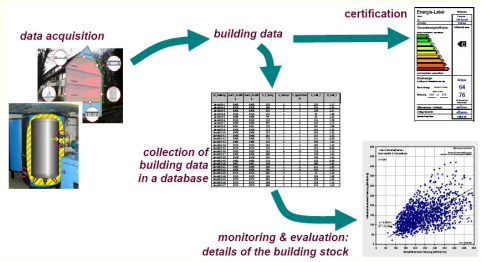
The IEE DATAMINE project: Collecting DATA from Energy Certification to Monitor Performance Indicators for New and Existing Buildings

Although high CO_2 reduction potentials in the European building sector are reported, in practice they are only partly tapped. The general lack of information about what is actually going on in the building stock is a great obstacle for creating well tailored and cost-efficient programmes to improve the situation.

DATAMINE aims at increasing the knowledge base by using Energy Performance Certificates as a data source. Due to the implementation of the Energy Performance Buildings Directive (EPBD) such certificates are issued for buildings all over Europe.

In the DATAMINE project basic experiences in central data collection and analysis will be made on a practical level. The key tasks of the project are:

- Development of a harmonised data structure and an evaluation scheme.
- Implementation of 12 Model Projects for data collection and monitoring in 12 countries. Each Model Project has an individual design concerning building and certification types as well as the data collection methods and the monitoring targets. The different national certification activities and the specific key actors are considered.
- Evaluation and cross-country comparison of the collected building data.
- Evaluation and cross-country comparison of the collection methods and monitoring schemes.



The results of the project are supposed to be a good basis for the implementation of harmonised monitoring systems in the building sector on regional, national and EU level.

The IEE project with partners from 12 different European countries is coordinated by IWU from Germany and will run from January 2006 up to December 2008.

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