

# Main Focus



## Office and home comforts

### Low energy use in buildings and a good indoor climate go hand in hand

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**S**ome would say that measures leading to low energy use in a building would lead to a poor indoor environment – we say that it is the opposite. A well insulated, airtight and moisture safe building with efficient technical building systems for heating, ventilation and/or cooling – if needed – is the best way to ensure a healthy indoor environment. In addition to that, the materials and products should be carefully chosen and the building should be designed and erected by using well-established methods. This will result in a sustainable building with good indoor climate.

#### Energy use in buildings

Buildings are the biggest energy consumers and CO<sub>2</sub> polluters, but hardly any other sector has such great

prospects in energy saving as the building sector. In industrial countries, space heating and cooling are the main “consumers” of energy (globally, mainly fossil fuel is used). In the early years of the 21<sup>st</sup> century, the energy use in the built environment in the European Union (EU) accounted for more than 40 % of the total energy use. This means that buildings, in contrast to popular belief, contributed more greenhouse gases than traffic (~31 %) and industry (~28 %).

Cost-effective technologies exist that could reduce the energy use in buildings by 22 % in the EU. Probably, the figures are the same in most industrialized countries. This would help to minimize greenhouse gas emissions. One of the greatest opportunities in conserving energy is to reduce heat

transfer through the building envelope in combination with improved energy-efficient heating, cooling and ventilation systems with heat recovery. These measures have a strong linkage to sustainable development.

Other aspects are related to comfort and economy. By reducing the need for heating and cooling, the annual cost of running the building is lowered. For a healthy indoor climate, the buildings must be well insulated, well ventilated and moisture safe. In order to achieve energy-efficient and healthy buildings, it is of utmost importance that the building technology interacts with the technical building systems for heating, cooling and ventilation. In order to meet these goals, well-established design tools are needed.

Methods are needed for the evaluation of the energy performance of complete buildings and parts of buildings or technical building systems. In order to arrive at energy efficiency, healthy buildings, materials and products that effectively contribute to the energy performance of the building and its technical building systems must be used. In this regard, standards dealing with the design and evaluation of materials, components and systems play an important role. Standards developed within ISO technical committee ISO/TC 163, *Thermal performance and energy use in the built environment*, fulfil this need.

### Bridging the gap between building technology and technical building systems

Many countries set limits for the total energy use of a building, based on a calculation procedure. ISO/TC 163 has taken the responsibility to develop a standard calculation procedure for the total energy use of buildings. The newly revised ISO 13790, *Energy performance of buildings – Calculation of energy use for space heating and cooling*, now integrates both space heating and space cooling. ISO/TC 163 does not deal in detail with all the parameters needed for such an integrated calculation procedure, and therefore cooperates with other committees dealing with e.g. the indoor environment.

In addition to requirements on the total energy use of buildings, requirements on specific aspects are often given on, e.g.:

- heat transfer through the building envelope (walls, windows, roofs, foundations, etc.);
- ventilation losses;
- performance of space heating, hot water supply and drainage;
- performance of ventilation and air conditioning systems;
- solar gains and loads;
- performance of lighting;
- energy use for heating, cooling, hot water, lighting, etc.

**“For a healthy indoor climate, the buildings must be well insulated, well ventilated and moisture safe.”**

### About the authors



**Prof. em Arne Elmroth** has been Chair of ISO/TC 163, *Thermal performance and energy use in the built environment*, since 1986. He was Professor in

Building Physics at Lund University and is a member of the Royal Swedish Academy of Engineering Sciences. Prof. Elmroth is a senior advisor on energy matters to, *inter alia*, the Swedish National Testing and Research Institute, SKANSKA AB, Swegon AB and Rockwool International, Denmark, and is often invited to international conferences, universities and companies to give lectures on building physics, building technology and energy conservation in buildings. He is the author or co-author of numerous papers and reports in the field of building technology. The most recent book is “Buildings and Energy – a systematic approach”.

In order to harmonize national regulations, ISO/TC 163 is prepared to work out standards with principles on how to express thermal performance and energy use of buildings and principles for energy declaration of buildings. A correct evaluation of the energy status of a building is one of the most important factors for a total environmental declaration of a building and its technical systems.

When designing healthy and sustainable buildings, the interaction between the building technologies, the technical building systems, the activities in the building, etc., must be taken into account. In this connection, it is important to define the (system) boundaries between the energy supply systems and the building with its technical building systems and the activities in the building. When dealing with standards related to the energy performance of a complete building, cooperation with other technical committees is essential. ISO/TC 163 at present liaises with nine other ISO committees.

### Energy declaration/energy certification of buildings

For a builder, owner or buyer of a building, the total integrated energy use and thus the energy performance of the building are of utmost importance. To clearly explain the influence of different parameters, energy declarations or energy certificates can play an important role. Such documents could be used as a basis for benchmarking or classifying the building.



**Margareta Andersson** is a building engineer. She has worked most of her life with standardization and has been the Secretary of ISO/TC 163 since the creation of

the committee in 1975 until 2007. She has also been the Secretary of CEN/TC 89, *Thermal performance of buildings and building components*.

## The scope of ISO/TC 163 as submitted in July 2007 to the ISO Technical Management Board for approval:

### Standardization in the field of building and civil engineering works

- of thermal, hygrothermal and energy performance of materials, products, components, elements and systems, including complete buildings, both new and existing, and their interaction with the technical building systems;
- of thermal insulation materials, products and systems for building and industrial application, including insulation of installed equipment in buildings;

### covering and including:

- test and calculation methods for heat and moisture transfer; temperature and moisture conditions;
- test and calculation methods for energy use in buildings;
- test and calculation methods for heating and cooling loads in buildings;
- calculation methods for daylighting;
- calculation methods for ventilation and air infiltration;
- calculation of energy performance of technical building systems and/or their interaction with the building;
- in-situ test methods for thermal, hygrothermal and energy performance of buildings and building components;
- input data for calculations, including climatic data;
- specifications for thermal insulation materials, products and systems with related test methods and conformity criteria;
- terminology, including definitions, physical quantities and symbols;

### and general review and coordination of work on thermal/hygrothermal performance and energy use in the built environment within ISO;

### Excluded:

- criteria for the indoor environment (ISO/TC 205);
- building control systems design (ISO/TC 205).

The goal of an energy declaration could be expressed as:

*To determine how much energy is used annually during normal weather conditions in a specific building in order to meet standard user requirements on thermal comfort and indoor air quality. The energy declaration should also supply information on the potentials for energy reduction.*

In most existing buildings, the energy performance of the building and how the building services are managed have a major impact on the total energy use and the indoor environment. The user behaviour and how well the technology interacts with users' requirements become more and more important the more energy efficient the buildings are.

Another important aspect that should be taken into account is the market for technical consultants, which further underlines the need for internationally accepted standards for calculation and tests in the areas dealt with by ISO/TC 163.

The conclusion is that the energy use in a building is a complex mixture between the building technology, the building technical systems, the maintenance of the building and the needs, as well as the behaviour of the users. This has to be considered in an energy declaration, when determining the integrated energy use of a building and making recommendations for energy conservation measures. Standards already developed or under way in ISO/TC 163 are useful tools for energy declaration of buildings.



## Fit for purpose

ISO/TC 163 has produced and will produce sets of standards by reference to which energy and thermal performance can be expressed at various levels, from materials and components to complete buildings. Lessons learned from the preparations of standards within the European Committee for Standardization (CEN) to support the European directive on Energy Performance of Buildings are that the efficiency of the preparation and the accessibility, transparency and efficiency of the standards can be drastically increased if the work items are less fragmented, as was the case in CEN.

## “Standards... are useful tools for energy declaration of buildings.”

Many standards produced by ISO/TC 163 are generic test and calculation methods. By calling up these methods in product standards and other specifications and by reporting properties in a harmonized way, material properties and product information to be used as input to the calculation methods prepared by ISO/TC 163 will be comparable and suited for its purpose.

ISO/TC 163 has also standardized *in-situ* methods (infrared inspections, pressurization tests, tracer gas methods) by which the thermal performance of complete buildings or building elements (such as walls, roofs, etc.) can be tested.

For easier understanding of the standards related to the indoor environment, thermal performance and energy use in the built environment, a common set of terms, definitions and symbols is necessary. ■