

# Standardization of green building technologies for environment design

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**Abstract.** The article describes the structure and field of standardization ISO / TC 205 “Building environment design”, provides examples of green building technologies. The main purpose of the article is to show the interaction between international ISO / TC 205 "Building environment design" and created in Russia in 2016 the Technical Committee of Standardization № 366 "Green technology of the build environment and green innovative products". Both of these technical committees promote green building technologies for environment design, thereby deal with the negative impact on the environment and the reasons of global warming. Instead of buildings that attempt to suppress and overcome nature, why not design buildings that integrate with the environment, on every possible level? The international standardization work which ISO/TC 205 “Building environment design” performs seeks, in addition to lowering trade barriers for engineering design, to promote and facilitate the design of high performance buildings: higher performing as economic assets for their owners, higher performing as buildings that provide amenable indoor environment for their occupants, and higher performing with respect to resource utilization and environmental impact.

## 1 International standardization of innovative green technologies

The standardisation related to the energy efficiency of heating and cooling systems as part of the overall energy use of buildings and has to take into account innovative green technologies. In Europe, The Energy Performance of Building Directive (EPBD) accelerated in Europe the standardisation activities in this field. Products are now no longer evaluated as products but as part of system. On the European Committee for Standardization (CEN) level a coherent structure has been put in place between product Technical Committees (TC), providing the basis for individual testing, system TC’s dedicated to specific uses as heating and cooling, and a “horizontal” TC responsible for the overall energy use in buildings for the aims of sustainable development at all.

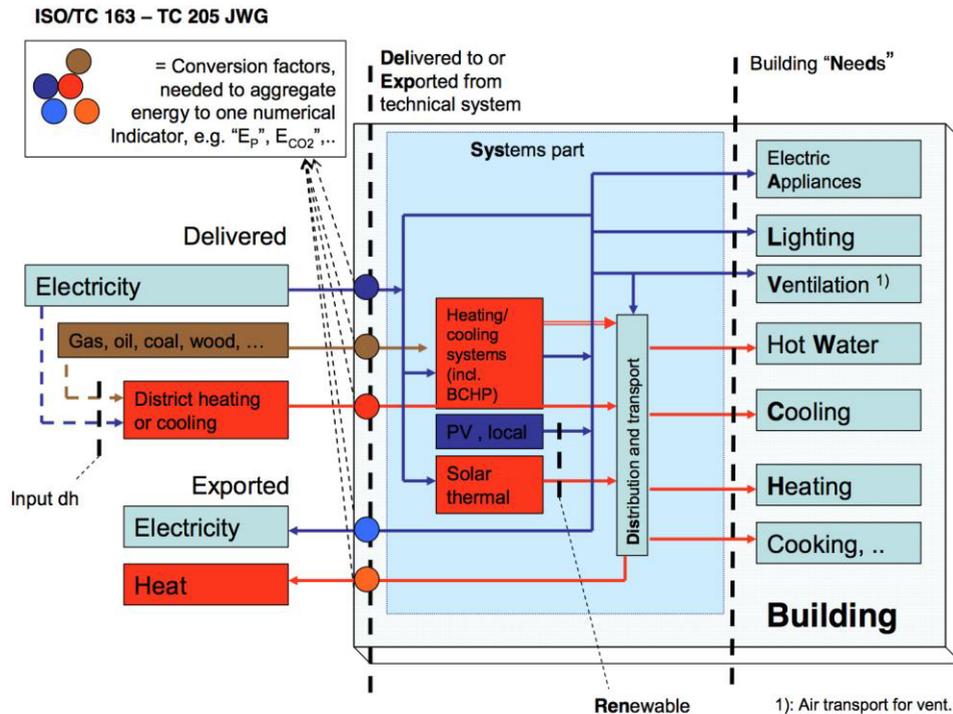
In 2008 the decision was made to bring the CEN EPBD standards, as produced under the mandate 343 EPBD, to the ISO level, the working group 9 “Heating and cooling

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systems” was established within ISO TC 205 “Building environment design” under the chair of Johann Zirngibl / France [1].

The scope of ISO technical committee ISO/TC 205 is standardization in the design of new buildings and retrofit of existing buildings for acceptable thermal and visual comfort, indoor air quality, and energy conservation by the green technologies (Fig. 1) [2]. Because of this scope, the committee treats the employment of materials and techniques in their optimal way in the design of buildings, which is intricately related to overall sustainability in building design. The unique opportunity afforded ISO/TC 205 is the holistic treatment of the many aspects of building environment design, which ultimately helps to determine the indoor environment.



**Fig. 1.** Scope of standardization the technical committee ISO / TC 205.

The main aspects of standardization ISO/TC 205 include the followings:

- sustainability related to indoor environmental quality and energy that can be addressed in the design of buildings and the design of retrofits of existing buildings;
- general principles of building environment design;
- design of energy-efficient buildings;
- building automation and control systems in building and retrofit design;
- indoor air quality in building and retrofit design;
- indoor thermal environment in building and retrofit design;
- indoor acoustical environment in building and retrofit design;
- indoor visual environment in building and retrofit design;
- design of heating and cooling systems including radiant; and
- application of methods of testing and rating the performance of building environmental equipment in the design of new buildings and retrofits.

Furthermore, the work of ISO/ TC 205 recognizes that architectural engineering – the design of building systems – can no longer be undertaken separately from the overall

design of buildings. The system of standards under development is intended to integrate both across engineering sub disciplines, and to vertically integrate architectural engineering with the entire building design process. With the standards developed by ISO/TC 205 providing the proper framework, the results of this integration can be buildings that respect the greater environment and provide safe and comfortable indoor environments.

ISO/TC 205 is organized into six active working groups, with two addition- all task groups currently evaluating future work items. Truly an international effort, the convenorships are distributed amongst Australia, Egypt, Republic of Korea, the United Kingdom, and the USA.

In ISO TC 205 several working groups were already dedicated to technical building systems, like WG3- “Building control systems design” (with a very successful cooperation with CEN TC247) and WG8- “Radiant heating and cooling systems”. ISO TC 205 is also dealing with indoor environment which is related to the performance of heating and cooling systems [3]. Because buildings must respect the environment by minimizing their impact on the external environment whilst providing safe and comfortable indoor environments [4].

### **1.1 Heating, ventilating, and cooling**

Heating systems in buildings represent an important market sector in Europe and worldwide. Heating systems constitute a key element in providing a comfortable and healthy environment in buildings. Heating of buildings in Europe is accounting for approximately 35% of the total energy use [5].

On the international level, calculation of heating systems for annual energy consumption is related to the Work program of ISO/TC 205 “Building environment design” and ISO/TC 163 “Thermal performance and energy use in the built environment”. For the energy performance of buildings using holistic approach, a Joint Working Group “Energy performance of buildings using holistic approach” was established between ISO/TC 205 and ISO/TC 163.

HVAC system efficiency can be improved by adding equipment that can convert delivered gas or electric power efficiently or by using economizers, which allow the automatic use of outside air or allow users to regulate space conditions. Energy codes provide minimum criteria for the size of HVAC systems and equipment, taking into consideration the energy demands of the building space [6, 7].

### **1.2 Building envelope**

Local climate plays a role in the energy code requirements for the material selection and techniques used to construct the building envelope. Code requirements specify the insulation levels in the floor, ceiling, and walls and are intended to seal the building against air leakage and moisture migration. The defined energy-efficiency levels of doors and windows take into consideration heat loss and gain, depending on whether heating or cooling of the building is the predominant concern, and daylighting [8]. Designers and contractors must make sure that the building materials and installation are completed as specified for the building to comply with the standards from ISO/TC 205.

## **2 Russian Technical Committee on standardization green technologies**

In 19.01.2016 Moscow State University of Civil Engineering (MGSU) initiated the establishment at the Federal Agency for Technical Regulation and Metrology (Rosstandart)

new Technical Committee on Standardization "Green technology of the build environment".

As a result of serious researches on harmonization the relevance of the standardization green technologies, conducted by experts MGSU and partners, then Rosstandart by order №1315 from 15.09.2016 decided to establish a Technical Committee for Standardization "Green technology of the build environment and green innovative products" (TC 366).

Created in Russia new TC 366 on standardization opens new areas of research in the development of science and technology, provides an improvement of existing results and normative-technical documentation, because "green technologies" - this is one of the basic systems of production activity, providing at all stages of life cycle the product (an object), its maximum compatibility to natural environmental, technogenic conditions and parameters in order to improve the quality of the human living environment [9].

Moreover on the rules of the Rosstandart to the Russian TC 366 was appointed international appropriate committee ISO / TC 205. So that Russian green technologies, engineers and scientists would be involved to the responsible decision on the build environment. Because regarding to the global climate change the "green" technologies are priority way of standardization to all over the world [10].

## 4 Conclusion

Equations The mistakes of the past in building design cannot be sustained into the future. The mistakes of the 1970's can inform us today. Standardization of energy efficiency alone is not a worthy goal, if it results in dissatisfied and unproductive occupants. To ensure the future, buildings must respect the environment by minimizing their impact on the external environment whilst providing safe and comfortable indoor environments by using green technologies.

To assure that technical building systems and services of building energy engineering are considered in appropriate way in the standardization work, it is important that the heating industry and service companies cooperates actively in the reorganization of the international standardization committees ISO / TC 205.

As the recast EPBD requires more specified energy performance declarations for heating, cooling and ventilation systems, it is expected that the EN or EN-ISO standards to be developed to support this, will satisfy the legislation need on national level. This expectation will, with support of a second mandate from the EU commission to CEN, enable the EU experts to work on these issues on the European level and at the same time contribute to the ISO level.

The position of the heating and cooling systems within the system standardization has now<sup>[1]</sup> well been established, especially on ISO level. The standardization of heating and cooling systems has an important position in the overall energy efficiency evaluation of the building and standardization work on ISO level is progressing.

The Brundtland Commission of the United Nations in 1987 stated that development is sustainable "...if it meets the needs of the present without compromising the ability of future generations to meet their own needs." Therefore Russian Technical Committee for Standardization № 366 "Green technology of the build environment and green innovative products" together with ISO/TC 205 "Building environment design" would be seeking how to standardize building environment design, including all aspects of sustainability and environmental responsibility.

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