

HVAC Energy Calculation Methodologies for Non-residential Buildings

WORKING GROUP

In many countries and regions, primary energy use or CO₂ emissions is used as an index representing the building energy performance, which is assessed by calculation methods. Key requirements for such calculation methods are claimed to be credibility, discrimination, repeatability and especially transparency. To be transparent, it is necessary to publish all of the logic for the calculations and all of the justifications for the input data. However, it seems that very few countries and regions have attained such an idealistic situation. The commonly faced difficulties seem to appear particularly due to the complexity and variety of non-residential buildings' functions and building services systems.



*An experimental facility for HVAC systems, showing an air handling unit undergoing testing.
Source: Building Research Institute, Japan*

PROJECT OBJECTIVES

- 1** collect technical documents published world-wide on the calculation methodologies of energy use for HVAC systems in non-residential buildings and on their scientific basis including research works on their validation
- 2** analyse the collected documents and pick up characteristics of methodologies, which are appropriate for broader utilization as good practice examples, and
- 3** identify areas in HVAC energy calculation methodologies lacking a scientific basis to suggest future R&D themes

Originally, many energy calculation methods were used for calculating space heating loads to evaluate the effectiveness of building envelopes and for sizing equipment. At that time, it was not critical to convert the loads into energy use, or to compare the energy use with that needed for other purposes. On the contrary, nowadays, the energy use index is a metric that allows an evaluation of energy-saving effectiveness of various kinds of energy conservation techniques. This index has to be able to fairly evaluate the contributions of the energy conservation techniques, and requirements for the index and its calculation methods need to be explained in more depth and shared among countries and regions.

Towards 2050, the results of the calculation methods will form the guidance for design and construction practice. Reduction of the energy use in each building and the total amount of expected reductions as a whole can be

INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA) was established as an autonomous body within the Organisation for Economic Co-operation and Development (OECD) in 1974, with the purpose of strengthening co-operation in the vital area of energy policy. As one element of this programme, member countries take part in various energy research, development and demonstration activities. The Energy in Buildings and Communities Programme has co-ordinated various research projects associated with energy prediction, monitoring and energy efficiency measures in both new and existing buildings. The results have provided much valuable information about the state of the art of building analysis and have led to further IEA co-ordinated research.

EBC VISION

By 2030, near-zero primary energy use and carbon dioxide emissions solutions have been adopted in new buildings and communities, and a wide range of reliable technical solutions have been made available for the existing building stock.

EBC MISSION

To accelerate the transformation of the built environment towards more energy efficient and sustainable buildings and communities, by the development and dissemination of knowledge and technologies through international collaborative research and innovation.

quantified mainly by such energy calculation methods. The intended effects on construction practice can be better guaranteed by continuing to improve the above-mentioned key requirements for the calculation methods. If good agreement between energy use in reality and predictions is secured, the calculation methods can be applied as a core part of policies to contribute substantially to the reduction of energy use and CO₂ emissions in the buildings sector. This is why it is necessary to continue to improve the calculation methods.

The planned deliverables from this project were:

- a report including the results of the analysis on national energy calculation methodologies for HVAC systems for non-residential buildings,
- a report detailing description and quoted information, and a summary report on the project findings.

Project duration

Completed (2016 - 2020)

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Further information

www.iea-ebc.org
