

Chapter 8

Improving the Energy Quality and Indoor Environmental Quality in Retrofit Buildings

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ABSTRACT

Energy requirements are variously specified in different countries. In many cases, different technology is applied. For this reason, improving the energy quality and indoor environmental quality in retrofit buildings requires a detailed study case. Modification of the building structure and technical systems is not sufficient. Therefore, it is necessary to change the behavior of inhabitants and create uniform zones in terms of usage. Preparation of the modernization of building requires elaboration of a detailed concept. Taking all aspects into account is not easy; that is why, in modernized buildings, the design phase often requires more work, time, and nonstandard solutions.

INTRODUCTION

The energy quality of existing building is very important from many reasons. The most noticeable is considered operating costs. In this chapter thermal comfort models and problems in modernisation of buildings are described. In the complex modernization process the project team and the goal should be selected properly. The architects and engineers must be open for new nonstandard solutions and ready to change their concept in case of problems with the implementation of the earlier assumptions. Apart from the aspects related to energy consumption for heating, cooling, domestic hot water, lighting, and auxiliary appliances in building, the project team should not forget about the occupants needs. The building without users does not consume any energy at all. Is it possible to consider such solution as ideal one? No, because the purpose of modernization should be to reduce the energy demand with the improvement of thermal comfort. There are several methods for assessing thermal comfort in buildings. In a modernized building, the most important problems should be first identified. Then, with the use of the available tools, right solutions can be applied to improve thermal comfort at the same time with

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a considerable reduction of energy use in the building. Sometimes, however, after the building retrofit the energy use might not be at the previously set level. Often the reasons for these condition (especially) in residential buildings are behaviors and habits of the users. That is why it is extremely important to explain to the users how the systems work and which behaviors affect energy demand and how. If any actions are not accepted by users, the introduction of the proposed solutions should be reconsidered.

BACKGROUND

The modernisation process of energy efficient buildings is complicated due to a large number of energy performance parameters of various building components (Sowa J. (red.), 2017). Often the first step in the process of building modernization is to define the energy performance indicator which fulfils the assumed standard. The definition of nZEB was introduced with the Energy Performance of Buildings Directive (EPBD recast, 2010/31/EC). According to Article 9 Member States are required to set a detailed national nZEB definition. However, in many countries, the standard is mainly related to the energy requirements of a building or building components (BPIE 2015).

An extremely important aspect is also the thermal comfort of occupants. Depending on the needs, the assessment of the thermal comfort in building might be performed with the use of, one of the comfort models described in the standards

NON-TECHNICAL BARRIERS IN RETROFIT BUILDINGS

There are many non-technical barriers that have to be overcome in order to achieve energy efficient retrofitting. The first one is skepticism to deep and overall modernization of the building including modernisation of external walls, installation system and also user behaviour. Next one is the owners' or users' lack of knowledge about new technologies and about additional benefits coming from increasing building energy performance such as possible improvement of the thermal comfort. (SQARE, KODnZEB)

Before modernisation the building owner should thus increase the knowledge about current user and technical employees' problems of building (European Parliament's Committee on Industry, Research and Energy (ITRE 2015).

The approach to modernization will be different for one-family houses, residential buildings and office buildings. In single-family buildings, in most cases, users know which measures affect the energy demand. Therefore, owners of single-family homes are more interested to make improvements.

In multifamily houses the modernization process will bring effects when tenants will be involved in the retrofitting process at its early stage. Another aspect is to increase their knowledge about energy saving measures and improvements of the thermal comfort of their flats. In office buildings, users should know how their behaviour affects energy use in building. For this purpose, appropriate training and rules should be provided.

The regulation barriers could also be related to the national legal requirements, such as lack of requirements on energy efficiency for existing buildings or the preference of only standard modernization measures (EU 2050).

Another group is financial barriers. The most common is high costs of realization of a complex retrofitting and the lack of suitable support programs for such investments.

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