TRAJNOSTNA ZASNOVA ENERGIJSKO UČINKOVITIH ENODRUŽINSKIH HIŠ

SUSTAINABLE DESIGN OF ENERGY EFFICIENT FAMILY HOUSES

Recenzija / Review
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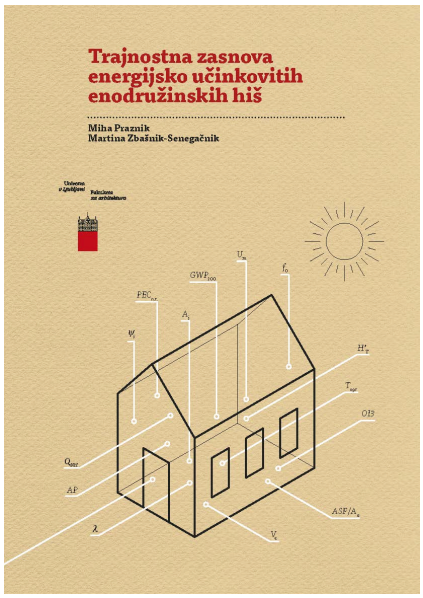

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Trajnostna zasnova energijsko učinkovitih enodružinskih hiš
Ljubljana: UL Fakulteta za arhitekturo, 2016
ISBN 978-961-6823-77-7

In the last twenty years, saving energy has been prioritized in all segments of its consumption. The primary goal of energy savings, especially the energy coming from non-renewable resources, is not only to reduce consumption due to limited availability of natural resources, but also for reasons of environmental protection. Consuming and processing energy coming from non-renewable sources leads to carbon emission and release of other toxic and dangerous substances into the environment, which results with many changes in the climate and life on Earth in general.

According to the European Union, the average energy consumption in buildings makes up over one-third of all energy use. That is the reason numerous laws and regulations in the EU member states have addressed the need to limit energy use in buildings.

Reducing energy demands in buildings can be achieved by increasing energy efficiency, which entails lower use of energy in the process of construction, heating, cooling, air-conditioning, water heating and lighting while maintaining the same level of comfort and pleasure of living or working in the buildings.

These requirements have made it customary to design buildings in which energy use is significantly reduced. Minimum energy efficiency standards have been prescribed by regulations while the actual degree of energy efficiency is in the cases of individual buildings determined by investors who have increasingly become familiar with the quality of life in buildings whose construction respected both energy efficiency requirements and the general awareness of possible threat to environment posed by irrational energy consumption.

Early solutions for achieving energy efficiency of buildings were focused on improving thermal protection of the building envelope through increased thermal insulation and high insulation-performance windows and doors. The next step was the construction of airtight building envelope and efforts to reduce thermal bridges. These architectural and structural measures, energy efficiency requirements were directed at increasing efficiency of heating and cooling systems, decreasing energy loss through ventilation of heated spaces in buildings (installation of highly efficient waste air heat recovery systems) and saving energy needed for the preparation of hot water and lighting. All these measures have indeed led to increased energy efficiency or reduction of energy demand associated with the use of buildings.

However, energy consumption is not only related to daily usage since the lifespan of buildings entails stages ranging from their construction, to use and, finally to their deconstruction. Energy consumption in buildings starts from the use of resources for the production of building materials and their processing, transport and use in the construction process and maintenance, and it ends with deconstruction of the built structures and the management of dismantled materials.

The majority of current requirements for energy efficiency is focused on the energy consumed in the course of the use of a building while it neglects to take into account the energy used in other stages of a building's life. Various building materials are characterized by specific energy requirements and the related environmental impact. Building material industry is a significant energy consumer and causes carbon emissions and other types of environmental pollution. Energy consumption in buildings over their lifetime represents the biggest part of the entire amount of energy used in all stages of the buildings' lives. Increasing energy efficiency implies a further increase in the use of building materials and products, which raises the level of energy consumption for the production of building materials and equipment. This dependent relationship means that the reduction of energy demand for the use of a building does not lead to the reduction of the total amount of primary energy used over a building's lifespan.

The first section of the book gives a detailed analysis of a building technology and thermal system used for the building envelope, and the consequent environmental impact caused by the production of materials that can achieve higher energy efficiency.

In the second section, the authors, well experienced in designing energy-efficient buildings, give their take on the topic of design and selection of qualitative parameters for achieving high energy efficiency based on an analysis of existing energy-efficient structures. Designing highly energy-efficient buildings is an interdisciplinary endeavour that inevitably links architectural design of the building envelope to the engineering part of work related to installations. It also entails testing the impact of individual plans on the final result during all phases of the design process. For that reason architects need to know the basic rules which can result in design plans for energy-efficient and cost-effective houses. Verification of energy efficiency in buildings is based on an analysis of different models and parameters which impact energy efficiency. It is therefore important to determine these parameters and how they can be most efficiently used in the search for most suitable design solutions.

The book gives results of the analysis that has been conducted on a sample of over hundred energy-efficient family houses in Slovenia. By interrelating individual parameters and analysing their impact on the result and the achieved energy efficiency it was possible to present optimisation procedures for achieving energy efficiency of family houses.

The book also shows results obtained through measuring energy parameters in the case of energy-efficient residential buildings, and results of a survey conducted on dozens of energy-efficient buildings in Slovenia. These results and previously determined parameters affecting energy efficiency formed a basis for guidelines which are crucial for individual segments that constitute the concept of energy efficiency of buildings as well as for determining engineering properties of installation systems.

The readers can find in the book around ten very good examples of passive and low-energy consumption houses in Slovenia with fundamental information on the houses, their energy performance, building technology and materials, HVAC systems, as well as illustrations and other particularities of each individual house.

"Sustainable design of energy efficient family houses" by Dr. Miha Praznik, a mechanical engineer, and Prof. Dr. Martina Zbašnik-Senegačnik, an architect, is a well-structured book, written in clear and understandable language and it contains numerous illustrations and graphs that further explain the topic. The book gives a detailed and systematic account of a new approach to design and construction of energy-efficient buildings with special emphasis on family houses. The presented topics form a basis for a new design process of highly energy-efficient buildings that takes into consideration the key parameters and indicators for a holistic evaluation of energy efficiency. As such, they also represent an original scientific contribution.

This book could only have been written by authors with abundant experience in design of energy-efficient buildings. Their professions supplement each other and form a common goal by which they have shown an inevitable link between architecture and engineering systems in finding solutions for energy efficiency requirements for buildings.

The authors' scientific and professional work resulted in numerous remarkable papers and projects in this field that stand out from typical architectural solutions. The book is intended for professionals and scientists whose main interest is energy efficiency of buildings and it builds upon the previous research and knowledge on the same topic. Furthermore, it lays the groundwork for future research and practice and can be greatly helpful in analysis and design of new highly energy-efficient buildings.