

Energy and environmental performance of the office building facade scenarios

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ABSTRACT

Energy efficiency is one of the main requirements that buildings must satisfy nowadays, both when designing new buildings or when major renovation takes place. The main issues that need to be considered in designing energy efficient buildings are: reduction of energy consumption generated from fossil fuels and reduction of environment pollution. Building envelope is the most responsible architectural element of the building that impacts thermal comfort and energy balance. Besides thermal properties of the envelope, equipment for heating, cooling and lighting influence largely on energy consumption in buildings. From the design point of view, the analysis of various facade scenarios, in terms of their contribution to reducing energy consumption, is crucial and necessary for each specific case and climate. This paper presents the estimation of energy performances of different scenarios of the hypothetical models of façade design, in case of an office building in Belgrade climate conditions. For the analysis, the model of the typical office was created and three various facade concepts were applied. Methodological approach entails three steps: design of different facade concepts - models, numerical energy simulations of the models and comparison of the results. For each of the three shading concepts, the following scenarios have been created: the basic scenario without shadings, and three scenarios of different facade design solutions related to types of shading devices. Assessment of the scenarios includes consideration of energy demands for heating and cooling, reduction of energy consumption for cooling by implementation of different shading devices and comparison of the results. The results of the simulations show how much the various alternatives of shadings contribute to the reduction of total energy demands, and how much the application of shadings affects the reduction of environmental pollution. The design method, as well as the results, can generally be applicable for the design of new and renovation of existing office buildings, both in Belgrade and in places with similar climatic conditions.

KEYWORDS

Energy efficiency; Energy savings; Office building; Shading devices; Heating and cooling energy demands; Facade design scenarios; Numerical simulation.

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