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Thermal analysis model building with a green roof and energy efficiency management

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Abstract

In the current study, the modeling and simulation of energy consumption for a two-story building with green roof in three different climates of Iran (Bandar Abbas: hot and humid, Tehran: mild and dry, and Tabriz: dry and cold) have been performed. This simulation aimed at investigation of the effects of the green roofs on reduction of thermal loads on the building and its role in reducing heat flux through the roof of the building. As the method, the building has been modeled by a software. This three-dimensional model by Energy Plus simulation software has been done. Simulation has been performed for different times of a year. For each of the three cities, a typical building with asphalt roof and a complete identical building with vegetation on its roof instead of asphalt, on its last layer, have been simulated and the results have been compared. The heat pumps have been used to provide heating and cooling loads on the building. The results of the simulation indicated that by the use of green roof, the annual baseline electricity consumption for heating and cooling loads were reduced up to 16.3%, 12.5% and 23% in Tehran, Tabriz and Bandar Abbas, respectively. According to the results, the use of green roofs in the tropical regions (Bandar Abbas) is more efficient compared to cold regions (Tabriz). The reason behind this phenomenon is the effect of the green roof as a cooler on the performance of the studied building's cooling system. The sensitivity analysis have shown that the energy consumption of described building is strongly dependent on soil thickness and vegetation density on the green roof structure as the more the soil thickness is, the better thermal insulator will be, and the higher the vegetation density is, the more powerful it will be, to prevent radiation from the sun.

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