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Parametric Analysis of Using PCM Walls for Heating Loads Reduction

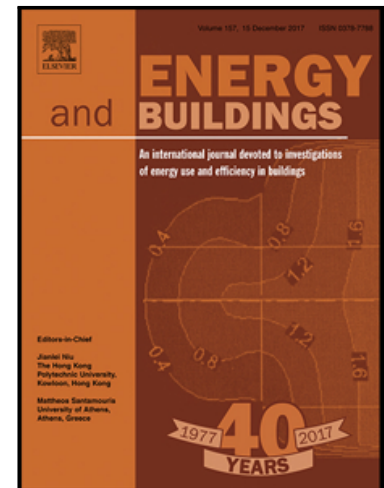
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Parametric Analysis of Using PCM Walls for Heating Loads Reduction

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Abstract

Using phase change materials (PCM) in buildings is considered as an effective way to reduce heating or cooling loads. In this study, a south-faced wall with PCM layer inside has been simulated in sunny hot summer weather in Shanghai city. The main purpose is to reduce the sharply increased heating loads to buildings due to high air temperature and strong solar radiation. The model is designed according to typical wall structure following local standards. The boundary conditions have been set using local weather data for the outside, while the indoor temperature is set at constant value considering air-conditioning operation. Comprehensive simulation investigations have been conducted by varying PCM type, PCM layer thickness and position in the wall parts. It is found that comparing to the wall without PCM layer, the best performance of the PCM wall after optimization can reduce the heat flow from 4238 kJ to 2757 kJ, with a reduction by 34.9%. The results obtained in current study can be served as guidance for local efficient building applications.

Keywords: Phase Change Materials; Solar heat; Wall; Heating loads reduction; Energy efficient buildings.

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