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Thermal insulation materials in architecture: a comparative test study with aerogel and rock wool

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Abstract

Thermal insulation has great potential to reduce energy consumption in buildings. This study aims to provide a general perspective by addressing the thermal insulation materials used throughout the history of the construction industry and to understand the current situation with developing technology. The literature review was used as a method in the study. The insulation values of current thermal insulation products were investigated and compared. An energy loss and gain analysis were carried out on the Revit-2019 model to understand the difference between the widely used rock wool and a nanotechnology product, aerogel-added thermal insulation material. In addition, the effect of the use of these products on the building cost is emphasized. The results of the study show that thermal insulation materials produced with nanotechnology examined have lower thermal conductivity coefficients compared to other thermal insulation materials. According to the analysis carried out on the Revit-2019 (Autodesk Revit Architecture/3D) model, the thermal insulation material with aerogel provides 8% savings in cooling loads compared to the use of rock wool. As a result of the analysis made on the Revit-2009 model, it was concluded that 8% savings were achieved in cooling loads in the use of aerogel-added materials compared to the use of rock wool, but the initial investment cost

was high. Developing competitive and sustainable materials is of the utmost importance. The literature review suggests that new composite insulators can be produced by combining suitable materials.