

Thermal Characterization of Smart and Large-Scale Building Envelope System in a Subtropical Climate

Authors : Andrey A. Chernousov, Ben Y. B. Chan

Abstract : The thermal behavior of a large-scale, phase change material (PCM) enhanced building envelope system was studied in regard to the need for pre-fabricated construction in subtropical regions. The proposed large-scale envelope consists of a reinforced aluminum skin, insulation core, phase change material and reinforced gypsum board. The PCM impact on an energy efficiency of an enveloped room was resolved by validation of the Energy Plus numerical scheme and optimization of a smart material location in the core. The PCM location was optimized by a minimization method of a cooling energy demand. It has been shown that there is good agreement between the test and simulation results. The optimal location of the PCM layer in Hong Kong summer conditions has been then recomputed for core thicknesses of 40, 60 and 80 mm. A non-dimensional value of the optimal PCM location was obtained to be same for all the studied cases and the considered external and internal conditions.

Keywords : thermal performance, phase change material, energy efficiency, PCM optimization

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020