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Effect of Double-Skin Facade Configuration on the Energy Performance of Office Building in Maritime Desert Climate

Authors : B. Umaru Mohammed, Faris A. Al-Maziad, Mohammad Y. Numan

Abstract : One of the most important factors affecting the energy performance within a building is a carefully and efficiently designed facade. The primary aim of this research was to identify and present the potentiality of utilising Double-Skin Facade (DSF) construction and critically examine its effect on the energy consumption of an office building located within a maritime desert climate as to the conventional single-skin curtain wall system. A comparative analysis of the effect on the overall energy consumption within an office building was investigated in which a combination of various Double-Skin Facade configurations, systems, and cavity depths, glazing types and orientations were utilised. A computer dynamic modelling was utilised in order to ensure accurate calculations and efficient simulations of the various DSF systems due to the complex nature of the various functions within the Facade cavity. Through the use of the dynamic thermal modelling simulations, the best cavity size glazed type and orientation were determined to lead to a detailed analysis of the efficiency of each respective combination of Double-Skin Facade construction. As such the optimal facade combination for use within an office building located in a maritime desert climate was identified. Results demonstrated that a multi-story Facade, depending on its configuration, save up to 5% on annual cooling loads respect to a Corridor Facade and while vented can save unto 12% when compared to the single skin façade, on annual cooling load in the maritime desert climate. The selected configuration of the DSF from SSF saves an overall annual cooling load of 32%.A comparative analysis of the effect on the overall energy consumption within an office building was investigated in which a combination of various Double-Skin Facade configurations, systems, and cavity depths, glazing types and orientations were utilized. A computer dynamic modelling was utilized in order to ensure accurate calculations and efficient simulations of the various DSF systems due to the complex nature of the various functions within the Facade cavity. Through the use of the dynamic thermal modelling simulations, the best cavity size glazed type and orientation were determined to lead to a detailed analysis of the efficiency of each respective combination of Double-Skin Facade construction. As such the optimal facade combination for use within an office building located in a maritime desert climate was identified. Results demonstrated that a multi-story Facade, depending on its configuration, save up to 5% on annual cooling loads respect to a Corridor Facade and while vented can save unto 12% when compared to the single skin facade, on annual cooling load in the maritime desert climate. The selected configuration of the DSF from SSF saves an overall annual cooling load of 32%.

Keywords : computer dynamics modelling, comparative analysis, energy computation, double skin facade, single skin curtain wall, maritime desert climate
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