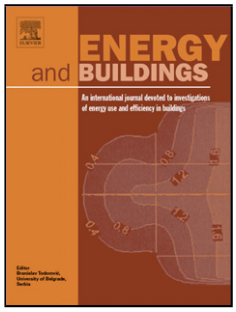

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Numerical and Experimental Investigations of the Impacts of Window Parameters on Indoor Natural Ventilation in a Residential Building

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ABSTRACT

Natural ventilation represents one of the challenges in green buildings design since the most important parameter that reflects the quality of building design is the thermal comfort within the indoor environment. This paper introduces experimental and numerical investigations for evaluating the impacts of natural ventilation on the thermal comfort inside residential buildings. Computational Fluid Dynamics (CFD) simulations were carried out to assess the wind environment within the study domain. Then, the solved flow field was used to calculate the temperature field. Validation of the simulation results was performed using experimental measurements. The parameters considered in the study were the air velocity, relative humidity, and the dry bulb air temperature. The study results show that there are significant thermal discomfort conditions inside the study domain, due to the lack of air circulation within the domain as a result of the building geometry. Accordingly, the obtained results reflect the need for design modifications in window parameters (window size, window placement, and shades) to improve the thermal comfort within the domain. Applying the design modifications led to a decrease in the air temperature by 2.5% and an increase in the air velocity within the study domain by six times.

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