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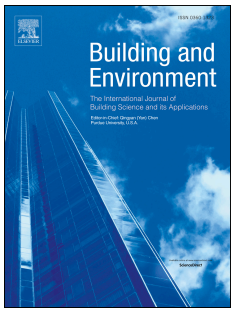

On the effect of provision of balconies on natural ventilation and thermal comfort in high-rise residential buildings

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On the effect of provision of balconies on natural ventilation and thermal comfort in high-rise residential buildings

Abstract

Natural ventilation and balconies are two of the most desirable features of a living space in subtropical climates. The aim of this paper is to investigate the effect of balconies on natural ventilation performance and thermal comfort of residential buildings. To this end, in-situ full-scale measurements were carried out for Computational Fluid Dynamics (CFD) model validation and further analysis. A number of parameters such as balcony type, balcony depth, ventilation mode, and wind angle were used in developing case studies. Once validated, the CFD model was used for investigation of air movement inside each case study. Combined and separate effects of the defined parameters on natural ventilation performance were evaluated using air velocity and Standard Effective Temperature (SET*) as criteria. The results indicate that the addition of a balcony to a building with single-sided ventilation can improve the ventilation performance. In contrast, indoor air velocity was reduced as a result of balcony addition when the case study was operated in cross ventilation mode. Furthermore, ventilation performance of single-sided ventilation was found to be more sensitive to the change of parameters compared to that of the cross ventilation. It has also been found that among the investigated parameters, incident wind angle affects the ventilation performance most for both natural ventilation modes.

Keywords: Natural ventilation; CFD; balcony; thermal comfort; single-sided ventilation; cross ventilation

1- Introduction

Natural ventilation is proven to be an effective low-cost solution for space conditioning, especially in cooling dominant climates [1, 2]. Being a passive solution, building energy consumption and