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Cross Ventilation in Waterfront Urban Canyons: The Case Study of Alexandria

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Abstract : Cross ventilation is an important and practical mean to achieve thermal comfort and conserve energy. This is especially true in the breezy waterfront settings. However, due to a number of factors, cross ventilation in buildings is usually studied by using oversimplified scenarios. It is then reasonable to study the impact of complex set of factors on the accuracy of predicting air flow rate because of wind driven cross ventilation. The objective of this paper is to provide architects with the tools necessary to achieve natural ventilation for cooling purposes in a waterfront urban canyon context. Also, urban canyons have not received much attention in terms of their impact on cross ventilation, and while we know how the wind flows between buildings in different urban canyon settings, the effect of the parallel-to-the-wind urban canyon on cross ventilation in buildings remains unclear. For this, we use detailed weather data, boundary layer correction factor, and CFD simulations to study the pressure patterns that form on the canyons surfaces in the case study of Alexandria. We found that the simplified numerical methods of calculating the cross ventilation in buildings can lead to inaccurate design decisions.

Keywords : cross ventilation, Alexandria, CFD, urban canyon
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