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Keynote Paper

Pedestrian-level mean wind speed around square buildings: Effects of height, width, size and approaching flow profile

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ABSTRACT

A series of wind-tunnel tests were carried out to investigate the characteristics of pedestrian-level wind around square buildings with various dimensions, in particular, to examine the effects of building height, building width, building aspect ratio, approaching flow profile and turbulence intensity. It was found that the downwash effect on pedestrian-level wind is significant for a building in boundary layer flow. The maximum speed-up ratio and speed-up area in boundary layer flow (BLF) are much larger than those in a uniform turbulent flow (UTF). The maximum speed-up ratio and speed-up area for a building with constant width in BLF shows an increasing tendency with building height, but this becomes less significant for higher buildings. For a building with constant height in BLF, increase in building width results in smaller aspect ratio, stronger blocking effects, and enhanced downwash effect and Venturi effect. Thus, the speed-up area increases exponentially with building width. For a building with constant aspect ratio in BLF, Venturi effect and downwash effect cause an exponentially increasing speed-up area with building size. Two types of downwash effect variations were found in this study: that due to change in flow pattern from 3D to 2D (Type 1) and that due to change in flow speed captured at around the front stagnation level (Type 2).

REFERENCE

Tamura, Y., Xu, X.D., and Yang Q.S. (2019), “Characteristics of Pedestrian-level Wind Speed around Square Buildings: Effects of height, width, size and approaching flow profile”, *J. Wind Eng. Ind. Aero. Dyn.,* **192**, 74-87.

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