

3rd International Conference on

Fluid Dynamics & Aerodynamics

October 25-26, 2018 | Berlin, Germany

Aerodynamic characteristics of super-tall buildings and pedestrian-level winds

Yukio Tamura^{1,2}, Xiaoda Xu³, Hideyuki Tanaka⁴, Yon Chul Kim², Akihito Yoshida² and Qingshan Yang¹¹Chongqing University, China²Wind Engineering Joint Usage/Research Center, Tokyo Polytechnic University, Japan³Beijing Jiaotong University, China

The trend of Manhattanization requires attention, particularly the preference for free-style building shapes, which are seen in Burj Khalifa and Shanghai Tower. Super-tall buildings have traditionally been designed to be symmetric rectangular, triangular or circular in plan, in order to avoid excessive seismic-induced torsional vibrations due to eccentricity. However, freewheeling building shapes have advantages not only in architectural design reflecting architects' challenging spirits for new forms but also in structural design in reducing wind loads. Development of analytical and vibration-control techniques has greatly contributed to this trend. In particular, cross-wind response, which is a major factor in safety and habitability of tall buildings, is greatly suppressed. The authors' group has conducted wind tunnel experiments on super-tall buildings with unconventional configurations to investigate the aerodynamic, response and pedestrian-level-wind characteristics. The findings can provide the structural designer with comprehensive wind tunnel test data that can be used in the preliminary design stage, and can be helpful in evaluating the most effective structural shape in wind-resistant design of tall buildings with various aerodynamic modifications. The characteristics of pedestrian-level wind are significantly affected by some important parameters such as corner modifications, twist angle of helical models, number of sides of building plan, etc.

yukio@arch.t-kougei.ac.jp