

# Good example of wind engineering challenges of the new generation of super- tall b...

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The challenges in wind engineering are increasing with an upsurge in super-tall building with innovative designs. A decade ago the Sears Building in Chicago was considered to be the tallest building at 440 meters; however this record was broken by Burj Khalifa in Dubai that stands at 830 meters. Wind engineering must constantly calculate the wind statistics to determine the roof height only from the ground based data, and it is difficult sometimes to conclude this height as the statistics depends on the wind speed and direction. The response of the tower to wind depends not only on its shape but also its stiffness distribution, mass distribution and damping (Irwin, 328). ASCE 7-05 in US and the National Building Code set the standards for wind design in the respective countries. The boundary layer models for the buildings documented in these standards have helped construct many super-tall buildings; however they do not support the atmospheric physics required for the current high rise novel shapes. The Harris and Deaves model is an improvement on the traditional model of 1960's as it is based on physical considerations. The wind speed in this model continues to increase with height all the way to the tops of super-tall buildings, and the flow is turbulent up there (Irwin, 329). The vortex excitation is also a critical factor that affects the slender towers. The vortex shedding forces can be eliminated by refining the shape of the building and aerodynamically promising shape can be developed by softening the corners, by spoilers, or by providing porosity and openings.

Wind tunnel is also used as an initiative to improve the aerodynamic shape. The new trend high rise buildings are being built in wind tunnels, and testing the high frequency force balance (HFFB) and there are multiple challenges

associated with HFFB for the engineers. Aeroelastic models are the measure to test the high rise buildings as they respond similarly to a simple cantilever. The further challenges for wind engineers are to understand the natural air circulation and integrated wind turbines.

## **Works Cited**

Irwin, Peter A. Wind engineering challenges of the new generation of super-tall buildings,  
334.