All articles in *Structures* are available free of charge to paying-grade members of the Institution as one of their membership benefits.

The journal is available online at: www.structuresjournal.org

Spotlight on *Structures*

Read the latest issue

Volume 51 of *Structures* (May 2023) is now available to read at **www.sciencedirect.com/journal/structures/vol/51**.

Ashraf Ashour, Associate Editor for *Structures*, has selected an article on the wind effects on a 282-metre-tall tower with complex aerodynamic shapes located in Suzhou, Jiangsu Province, China, using two different models.

The article will be available free of charge for six months.

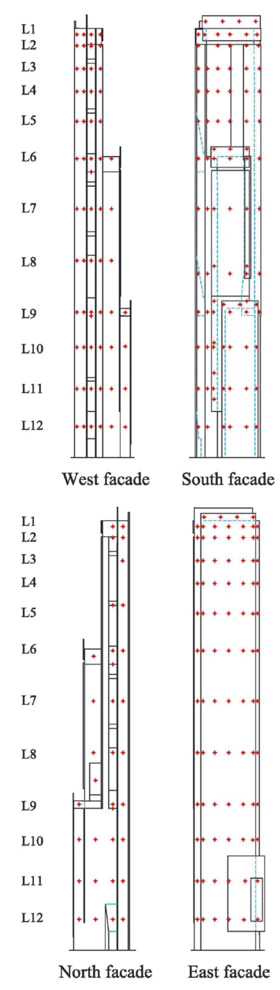
Editor's Featured Article

Experimental investigation of wind effects on a 282-metre-high tower with complex aerodynamic shapes based on a rigid model and multi-degree-of-freedom aeroelastic model

Guoqiang Fu, Yong Quan, Ming Gu and Peng Huang
State Key Laboratory of Disaster Reduction in Civil Engineering, Tongji University, Shanghai, China

Slender and flexible high-rise structures are very sensitive to large wind-induced vibration phenomena such as vortex-induced vibration and galloping under strong winds. However, pressure measurements on rigid models cannot consider coupling aeroelastic effects, and single-degree-of-freedom aeroelastic model wind tunnel tests can only consider the contribution of the first-order linear mode. For wind-sensitive structures with complex aerodynamic shapes, the effect of higher-order modes on the wind-induced response may not be ignored. In this study, a series of multi-degree-of-freedom (MDOF) aeroelastic model wind tunnel tests and pressure measurements of a rigid model were conducted to comparatively investigate the wind effects of a 282-metre-high tower with complex aerodynamic shapes. A detailed analysis of the aeroelastic effects on the high-rise tower is presented, and the effects of the structural damping ratio, wind speed, and wind direction are also discussed. The results show that the variation trends of the peak acceleration responses are generally consistent, while in those wind-sensitive directions (165-degree wind direction), the peak acceleration responses of the MDOF model are almost 1.5 times larger than those of the rigid model, indicating that the aeroelastic effects are remarkable. The corresponding response spectral peak values of the MDOF model are significantly larger than those of the rigid model by a factor of more than 3 and the correlations of responses in the two orthogonal directions also increase greatly by 43.5%. However, the 'set-back' aerodynamic shape (180-degree wind direction) can considerably weaken aeroelastic effects and the peak acceleration responses are close to those of the rigid model. The generalised aerodynamic force spectrum also shows broadband features, implying its superior aerodynamic performance. The comfort assessments for different structural damping ratios are conducted based on various codes and criteria, suggesting that the structural damping ratio should be larger than 3%. The equivalent static wind loads on the upper floors are notably affected by aeroelastic effects while the lower floors are relatively insensitive. This study provides a detailed perspective of the aeroelastic effect for slender tower, and hence facilitates the wind-resistant design of flexible structures.

→| Read the full paper at **https://doi.org/10.1016/j.istruc.2023.03.033**



Register for alerts

If you'd like to receive regular updates about new content in *Structures*, register for email alerts at **www.sciencedirect.com**.