

学术报告

用于城市环境中建筑物的高性能风能系统

High-performance wind energy system for buildings in an urban environment

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Abstract

This presentation presents the findings of recent research undertaken collaboratively at The University of Sydney, Hong Kong University of Science and Technology and Western Sydney University in the applications of building-integrated wind turbines and other wind power generation systems in an urban environment. These studies focused on the utilisation of building configurations, in particular double-skin façade and through-building opening, to facilitate the integration of wind turbines and other wind energy harvesting devices in buildings for wind power generation. In addition to conventional horizontal axial type wind turbines, an innovative linear cascade wind turbine, referred to as a PowerWindow, has been studied in details for its potential integration in buildings. Other wind energy harvesting systems based on aerodynamically-modified enhanced aeroelastic response of wind-sensitive bluff bodies, including square prisms which are prone to vortex-induced lock-in and galloping, and circular cylinders which are prone to vortex-induced vibration and lock-in, have also been studied for their potential applications in and around buildings. Wind tunnel model tests were conducted to measure local/global wind flow characteristics and wind pressure/force distributions to study the effects of operating wind speed, in particular critical speed effects, turbulence and wind directionality. These measured results were used to benchmark simulated results using CFD. For the PowerWindow, its performance was also assessed by testing a prototype in a large cross-section wind tunnel.

Short Bio of Professor Kenny Kwok

Professor Kenny Kwok is currently a Professor of Engineering at The University of Sydney. He was previously Professor of Engineering at Western Sydney University (2008 to 2017), Professor of Civil Engineering at Hong Kong University of Science and Technology (1998-2008) and Professor of Wind Engineering at The University of Sydney (1999-2002). His research interests include wind engineering, structural dynamics, vibration control, human perception of motion, and environmental fluid mechanics, particularly with respect to the dynamic behaviour of tall buildings and flexible structures in strong winds. His research focuses on fundamental aspects of building aerodynamics and wind-structure-occupant-damper interactions, and their practical applications in real life situations. He has published over 500 articles in journals, book chapters, invited and keynote papers, and conference papers. He is the recipient of 2019 ASCE Jack E. Cermak Medal, 2019 International Association for Wind Engineering Senior Award and Davenport Medal, a Life Member of the Australasian Wind Engineering Society, and a Fellow of the Hong Kong Institution of Engineers and Institution of Engineers, Australia.

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