

Wind Load Effects on Tall Buildings: Coupling, Aeroelastic and Inelastic Effects

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Abstract

This talk will discuss some of the advanced analytical frameworks for evaluating wind load effects of tall buildings. Buildings with either complex geometric shapes or structural systems with noncoincident centers of mass and resistance, or both, may undergo three-dimensional coupled motions when exposed to spatiotemporally varying dynamic wind loads. This talk will introduce the analysis framework of coupled motions with a new closed-form formulation of correlation coefficient of modal responses. The combination rules for estimating extremes of linearly and nonlinearly combined responses will be discussed. This talk will also discuss the analytical solution of extreme and fatigue responses of crosswind-excited tall buildings with amplitude-dependent nonlinear aerodynamic damping at the vicinity of vortex lock-in wind speed. Finally, this talk will address the inelastic responses of wind-excited tall buildings and explore the potential benefit of inelastic design beyond the current elastic design.

Short Bio

Dr. Xinzhong Chen is Professor of National Wind Institute, Department of Civil, Environmental and Construction Engineering at Texas Tech University. Prof. Chen's research interests include bridge and building aerodynamics, modelling and simulation of wind load effects on dynamically sensitive structures, nonlinear aerodynamics and non-stationary wind load effects, reliability- and performance-based design of structures to extreme wind loading, probabilistic fatigue and extreme response of large wind turbines. Prof. Chen has published more than 150 refereed technical papers in international journals and conference proceedings, which have received significant number of citations. Prof. Chen's research has been sponsored by National Science Foundation (NSF), Department of Energy (DOE), and Texas Department of Transportation (TxDOT). Professor Chen's research accomplishments have been highly recognized both nationally and internationally. Professor Chen is the recipient of the Whitacre Research Award, the Ed and Linda Whitacre Faculty Fallow Award from Texas Tech University for prestigious recognition of his research accomplishments. Recently, Prof. Chen has been selected by ASCE to receive the 2017 Jack E. Cermak Medal, one of the highest recognitions in the field of wind engineering, for his numerous distinguished contributions to wind engineering.

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Location: 140 Ketter Hall, North Campus, University at Buffalo