

# Effects of Wind Loading Cross-correlation on Structurally Coupled Response of Tall Twin Buildings in Close Proximity

Juntack Lim<sup>1</sup> and Bogusz Bienkiewicz<sup>2</sup>, *Wind Engineering and Fluids Laboratory, Department of Civil and Environmental Engineering, Colorado State University, Fort Collins, CO 80523, USA*

## ABSTRACT

This paper describes a parametric study of the correlations and coherences of components of wind loading exerted on tall twin buildings in close proximity, and their effects on response of structurally coupled tall buildings. Light models of two identical generic tall buildings of square plan were mounted on a dual-HFFB (DHFFB) comprising of two high-frequency force balances, and the base wind loading exerted on the buildings was simultaneously acquired. A 6 x 6 correlation matrix of the three components of the loading (two sway moments and a torque) on the two buildings was calculated and the loading correlations were investigated. High magnitude, up to 0.66, was observed for the cross-covariance of the alongwind and the torsional components, on the downstream building. This is in contrast with the results for an isolated tall building. Subsequently, the coherences involving of the base wind loading components were examined. Finally, the correlation and coherence effects on the building response - the corner acceleration of the top floor - were assessed. Based on the obtained results it was concluded that, due to significant inter-building coupling effects, it is desirable to incorporate aerodynamic coupling (e.g. determined using the DHFFB) in wind engineering analysis of structurally coupled tall twin buildings in close proximity.

<sup>1</sup>*Ph.D. Candidate, ([juntack.lim@colostate.edu](mailto:juntack.lim@colostate.edu))*

<sup>2</sup>*Prof. / Director and Corresponding Author ([bogusz@engr.colostate.edu](mailto:bogusz@engr.colostate.edu))*