

Research Studies in Structural and Wind Engineering at the University of Western Ontario, Canada

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Abstract:

An extensive research program in various applications in Structural and Wind Engineering is currently undertaken at Western University. The research is supported by unique infrastructure and testing facilities recently established at Western. The presentation starts by providing a quick overview about the department of Civil and Environmental Engineering at Western. Two research facilities, the Insurance Lab for Better Homes and the WindEEE dome, enabling full and model scale testing of structures under various types of wind storms will be described. Two research projects currently undertaken by the presenter and his research team will be then discussed. The first project focuses on studying the behaviour of transmission line structures under downbursts and tornadoes. This is conducted as a response to the failure of a number of towers in Canada and abroad. The wind field associated with those events was developed using Computation Fluid Dynamic simulations as well as experimental results and field observations. Those were incorporated into a Finite Element Model in order to study the behaviour and failure modes of transmission line structures under this type of extreme wind events. The second project is related to the use of tuned liquid dampers as auxiliary devices for controlling the vibration of slender structures. These devices consist of shallow water tanks that are typically mounted at the top of the structures. The dimensions of the tanks are selected such that the frequency of the sloshing motion matches the frequency of the mode of the structure to be suppressed. Tests conducted on a shaking table device as well results of numerical modeling and practical cases in which the tanks were used to control the torsion motion of an L-Shaped high rise building will be presented.