



Università degli Studi di Padova

DIPARTIMENTO DI INGEGNERIA CIVILE, EDILE E AMBIENTALE - I C E A DEPARTMENT OF CIVIL, ENVIRONMENTAL AND ARCHITECTURAL ENGINEERING

Controlled Rocking Steel Braced Frames: Connecting Research and Practice

Prof. Lydell Wiebe McMaster University (Canada)

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<u>Abstract:</u> Because of their potential to avoid structural damage during design-level earthquakes, controlled rocking steel braced frames (CRSBFs) are attracting interest from researchers and practicing engineers alike. In a CRSBF, selected columns are permitted to uplift from the foundation, limiting the peak seismic forces while also avoiding structural damage and residual deformations. Post-tensioning and/or energy dissipation technologies are used to control the response. This seminar will use examples from both research and practice to examine three key issues for CRSBFs:

- 1. A designer has a wide range of options for selecting post-tensioning and energy dissipation. These options will be demonstrated using examples from buildings that have been constructed recently, and recent numerical results will also be presented to show how to target a desired level of performance.
- 2. The capacity design of the frame must account for the forces that develop due to the higher modes. Shake table test results will be used to illustrate how these forces develop and can be mitigated, and methods for predicting these forces will be assessed based on nonlinear time history analysis.
- 3. The connections between the CRSBF and the floor diaphragms are critical to the overall behaviour of the structure. Several alternative connection methods will be discussed, using illustrations from practice.

About the presenter: Dr. Wiebe works to develop simple, inexpensive solutions for problems in earthquake engineering and structural dynamics. His research at McMaster University focuses on predicting and mitigating damage due to earthquakes, particularly for steel structures, by using advanced nonlinear analysis tools and large-scale physical testing. Dr. Wiebe is the Secretary of the Canadian Association for Earthquake Engineering, and he led the writing of a New Zealand Design Guide for Controlled Rocking Steel Braced Frames. He holds a PhD in Civil Engineering from the University of Toronto and an MSc in Earthquake Engineering from the ROSE School in Pavia, Italy.

