ABSTRACT:
A post-tensioned column (PT) base connection is developed for use in self-centering moment resisting frames (SC-MRFs). The softening behavior at the connection is provided by gap opening and elongation of PT bars rather than yielding in the column. SC-MRFs exhibit negligible residual drift after a seismic event, and damage is limited to replaceable fuse elements. In the PT base, additional shear resistance is provided by bolted keeper plates; additional energy dissipation is provided by buckling restrained steel (BRS) plates. To investigate the cyclic behavior of the PT column base connection, a series of PT column base connection subassemblies were subjected to axial load and cyclic lateral displacements. Test parameters included initial post-tension force, initial axial force in column (constant or varying), column size and loading history. Limit states investigated for the PT column base connections included PT bar yielding and fracture of BRS plates. The test results demonstrated that properly designed PT column base connections were able to undergo lateral displacement up to 4% interstory drift while the columns and grade beams remained elastic. Also, the BRS plates showed good energy dissipation capacity by yielding in tension and compression without fracture. Structural damage at column bases was limited to the replaceable fuse BRS plates. In addition, analytical models were developed to predict the moment-rotation relationship of the PT column base connection and showed good correlation with the experimental data.

BIO:
Judy Liu is an Associate Professor of Civil Engineering and Associate Director of Bowen Laboratory at Purdue University. She holds a Bachelors of Architectural Engineering (BAE) from the Pennsylvania State University and M.S. and Ph.D. degrees in Civil Engineering from the University of California at Berkeley. Dr. Liu’s primary research interest is in the robustness of steel buildings, including sustainable seismic design, disproportionate collapse mitigation, and considerations for multi-hazard resilience. She received an AISC Faculty Fellowship for research on steel slit panels for lateral resistance. Dr. Liu’s courses include undergraduate and graduate structural steel design, and seismic design of steel structures. Her awards for teaching and advising include the Roy E. and Myrna G. Wansik Teaching Award, the College of Engineering Advising Award, the Edmund M. Burke Outstanding Faculty Member (awarded by members of Chi Epsilon), and the Harold Munson Outstanding Teacher Award. Dr. Liu is a member of a number of committees, including ASCE/SEI Disproportionate Collapse Mitigation Standard Committee, NCSEA Basic Education Committee, and AISC Partners in Education Committee. She has been honored with an AISC Special Achievement Award for her contributions to the Partners in Education Committee and other efforts to improve structural steel education.