# Developing a rational basis for structural design

Reagan Chandramohan
Tim Sullivan
Chris McGann

# Background and Motivation

- Current seismic design practice employs a structural performance ($S_p$) factor to reduce the seismic design actions on ductile structures
- The $S_p$ factor was first introduced in NZS 4203 (1992) and later carried over into NZS 1170.5 (2004) and a number of other seismic design, assessment, and retrofit guidelines
- The rationale provided for its use in the commentary to NZS 1170.5 is to implicitly account for a number of conservative elements in the seismic design process:
  - Designing for peak transient response is conservative in nature
  - Structural components and structures possess some level of overstrength
  - Structural damping is usually underestimated
- More pragmatically, the $S_p$ factor is used to lower seismic design loads and bring them on par with other international seismic codes
- Jury (2003) states that the $S_p$ factor was devised to reflect *"how well a building designed using codified materials standards and a codified earthquake loading regime might perform compared with specified broad performance objectives"*

# Objectives

- Quantify the various effects that the $S_p$ factor implicitly accounts for, including
  - The relationship between peak and average transient responses, and how they relate to structural design
  - Overstrength in structural components and structures
  - The amount of damping provided by nonstructural elements and soil-foundation-structure interaction
- Develop a more rational basis for estimating seismic design actions by explicitly considering these effects if needed
- Link seismic design loads with more explicit performance objectives developed in conjunction with concurrent design code benchmarking efforts

# Status

- Refinement of project objectives and scope
- Search and interviews of suitable PhD students