Issue 8: Duration

John Hooper, P.E., S.E.
Director of Earthquake Engineering
Magnusson Klemencic Associates
The Fundamental Issue

Crustal record
Duration ~ 25-35 seconds
Strong motion ~ 10-20 seconds

Subduction record
Duration ~ 3-4 min
Strong motion ~ 1-1/2 min
Current Design Procedures

- Developed and calibrated mostly based on observation of the response of structures to moderately large earthquakes (M6 to M7)
- Duration of strong shaking ranging from perhaps 10 to 20 seconds
- Longer durations (such as from Subduction events) not currently included
Proposed Study

• Evaluate whether current design procedures should be modified
• If modification is warranted, determine approach(es) to be used:
  – Duration factor added to base shear equations
  – Mapped duration values (similar to $T_L$)
  – Other approaches
Risks

• Present technology and test data may not be adequate to allow proper characterization of the effects of duration
• May required use of subjective criteria in the near team until better capability and data is available
Importance

• Current design procedures may not provide targeted safety for buildings subjected to very long duration motions
Resources

• Research to evaluate behavior of buildings designed to present code requirements, when subjected to very long duration motion

• As a minimum, literature review to determine
  – Availability of hysteretic data based on “long duration” shaking
  – Appropriateness of analytical modeling to predict the long duration effects

• If hysteretic data is not available, testing of components would be required
Schedule

• If long duration hysteretic response data is available
  — ~2 years of study would be required to develop recommendations

• If data is not available
  — ~3-5 years would be required