Earthquake Engineering Issues for the Pacific Northwest

- Earthquake Engineering Issues for the US
- Earthquake Engineering Issues for the Pacific Northwest
- Key Issue for Both: Minimizing Changes in Resulting Design Values, Unless Warranted
Earthquake Engineering Issues for the US

- NERHP Provisions and ASCE 7-10 Uses:
  “Risk-targeted” Maximum Considered Earthquake (MCE$_R$) Ground Motion Spectral Response Acceleration maps and associated design parameters

- Targeting Uniform Risk of Collapse
  - 1% in 50 year collapse risk

- Calculated Assuming a Generic Collapse Fragility with:
  - 10% collapse probability given MCE ground motions
Calculating $MCE_R$ Ground Motions

Calculated Iteratively by Combining:

- Building Fragility Curves defined by Project '07
- GM Hazard Curves (e.g., from USGS)

Risk Target defined by Project '07

Prob. of Collapse in 50 yrs = 1%

... via “Risk Integral” (e.g. ATC 3-06), i.e., ...

\[ P[\text{Collapse}] = \int_0^\infty \frac{dP[\text{Collapse} | SA = a]}{da} \cdot P[SA > a] \, da \]
Earthquake Engineering Issues for the US

- Risk-targeted Spectral Response Accelerations for:
  - Functional Level EQ
  - Service Level EQ

- Maximum Direction Spectral Response Accelerations
Earthquake Engineering Issues for the US

- Multiple-point Spectrum (up to 10 seconds, if possible), including:
  - $T_L$
  - Near source ground motions
- Updated Site Amplification Factors
- Basin Effects for Multiple Locations
Earthquake Engineering Issues for the Pacific Northwest

- Existing and New, hypothesized Fault Updates
- Approximate 50-year Probabilities
Earthquake Engineering Issues for the Pacific Northwest

- PNW Basin Effects (Seattle, Everett, etc.)
- CSZ Attenuation Relationships and Their Impact on Design Values
Earthquake Engineering Issues for the Pacific Northwest

• Update on CSZ Durations and Their Effect on Building Performance
  • Work together to develop a meaningful design parameter

• CSZ Ground Motion Records for use in Nonlinear Response History Analysis