Introductory Comments

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Typical Approach for Design Time Histories

- Specified Design Event
  - M, R, Site, Spectrum
- Engineers Request: Provide small set of representative ground motions time series
  - e.g. 1-7 sets of time series
- Ground Motion Analyst
  - Select ground motions with similar M, R, site, directivity condition
  - Modify the ground motion to be consistent with the design spectrum
    - Scaling
    - Spectrum compatible
  - Preference for less scaling

Summary from the 2004 Meeting

- Large variability of non-linear response of structures from recordings with similar M,R and ground motion level
  - For small number of time series (e.g. 3-7), results sensitive to the selection of the time series
- No well founded objective criteria for selecting time series
  - Left to judgment
  - Problem is getting worse as the number of recordings grows
- Can't develop an objective selection criteria until the intended use of the time series is specified.
  - Need more interaction between ground motion analyst and engineer evaluating the structure

Summary from the 2004 Meeting

- Need to decide if we are after average response or variability of response
  - Most participants agreed we are after the average response given the design spectrum, not the variability of the response
  - The design spectrum already has the return period of the ground motion in it
- We can do better than just randomly selecting records from similar magnitude-Distance bin
  - Epsilon value (Cornell's approach)
  - Simplified non-linear system
- PEER DGML
  - Records selected to capture variability of the response

Summary from the 2004 Meeting

- Modification of time series
  - Scaling by a constant factor
    - Large scale factors can lead to a bias in the response if random records in M-R bin are used
    - Large scale factors can lead to unbiased results for some time series
      - Need to consider additional parameters to be able to identify records that can be scaled by large factors
  - Spectrum compatible
    - Not considered in 2004 meeting
    - To be addressed in 2005 meeting

Summary from 2005 Meeting

- Time Histories for Building Code
  - Requirements
  - Intent
- Examples of time series selection and modification from different projects
  - Scaling
  - Spectrum compatible

Summary from 2005 Meeting

- What do we do with a record that leads to unacceptable performance?
  - Ignore it.
    - Just consider average response
  - Consider it
    - Require structure to pass for all records
    - This corresponds to an increase in the return period of the ground motion
- No common basis for comparing methods
  - For 2006, apply multiple methods for the same structure