

**Ground Motion Selection and Modification (GMSM) Working Group**  
**Summary of Working Group Meeting**  
**10am – 2pm July 17, 2006**  
**PEER Headquarters**

Participants: Norm Abrahamson, Yousef Bozorgnia, Allin Cornell, Christine Goulet, Curt Haselton, Erol Kalkan, Nico Luco, Tom Shantz, Jon Stewart, Polsak Tothong, Melanie Walling, Jennie Watson-Lamprey, Marcello Bianchini, Frank McKenna

**Progress on analyses of OpenSees and other nonlinear models**

Ten structural models have been selected for preliminary analyses. The models were selected to provide a range of structural properties, heights and response characteristics while minimizing the number of models. The models selected are:

1. 4-story RC frame benchmark building (Curt)
2. 12-story RC frame ATC (Curt)
3. 20-story RC frame ATC (Curt)
4. 6-story steel frame (Erol)
5. 13-story steel frame (Erol)
6. 19-story steel frame (Erol)
7. 12-story RC shear wall (Curt)
8. 12-story RC soft-story (Curt)
9. 12-story RC non-ductile (Curt)
10. Will decide to select models from Krawinkler's Drain structural models

Results from the analyses reported to the group shall include:

1. Floor accelerations
2. Transitory interstory drift
3. Residual interstory drift
4. Maximum plastic beam hinge per story
5. Maximum plastic interior column hinge per story
6. Maximum plastic exterior column hinge per story
7. Transitory roof drift
8. Residual roof drift

Structural characteristics reported to the group shall include:

1. Plan and elevation views
2. Year of design
3. Building code used for design
4. Fundamental mode periods and their mass participation factors
5. Design base shear and corresponding weight
6. Expected global ductility
7. Pushover curve

- Jennie will distribute a template excel file for the results of the nonlinear dynamic analyses using the suite of 98 time series scaled by factors of 1,2, 4 and 8, and for characteristics of

the buildings to be analyzed. Note: the excel file was distributed in an email dated July 24, 2006. The modelers will fill in all available information and results by August 14th and redistribute the files to the group.

- Yousef will check with Farzin (Krawinkler's former student) to get more information about the Drain models to be used.
- For the next meeting Erol will present an example of how to estimate the equivalent SDOF for a MDOF system via pushover analysis.
- Yousef will check the availability and feasibility of using the UCSD supercomputer to run Drain.

### **List and summary of ground motion selection and modification methods**

Nico and Christine presented the preliminary list of methods. They will reformat the PowerPoint presentation as a word document, generalize the methods and distribute the list to the group. Group members will then add paragraphs of explanation to the methods.

### **Process of computing pdf of structural response for M7 Rrup10**

The goal is to compute "true" response of building models subjected to many ground motion records. Discussion continued from last meeting. Process tentatively agreed upon by the group:

1. A suite of records from Mw6.75-7.25, Rrup 0-10km events was developed. A total of 98 records were distributed to the group.
2. The suite will be run through each model using scale factors of 1, 2, 4 and 8.
3. A model of the desired structural response parameter using properties of the input time series (e.g.  $S_a(T_1)$ ,  $S_a(2T_1)$ , duration, etc.) will be developed.
4. The model will be checked to ensure that there is no bias with scale factor.
5. Models for the record properties that affect response, and correlations between record properties will be developed using the full PEER database.
6. The joint pdf of record properties as a function of magnitude and distance will be calculated.
7. Using the joint pdf of record properties and the model for building response based on those record properties the pdf of structural response for a M7 Rrup 10 event will be calculated.

For the next meeting Jennie will prepare an example analysis using preliminary results from the modelers for review by the group.

**The next meeting on August 21<sup>st</sup> will be held at the new PEER headquarters in Davis Hall. Yousef will distribute the room number and details on parking.**