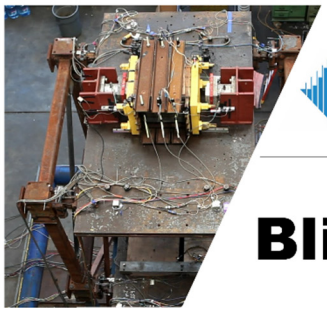

Blind Prediction Contest 2022

PEER Blind Prediction Contest of Shaking Table Tests for a Passive Structural Control Using an Impact Mass Damper

General

1. All information and details regarding the blind prediction contest can be found in the following web site: https://peer.berkeley.edu/news-and-events/2022-blind-prediction-contest.
2. The competition will be open on September 1, 2022 and the deadline for submissions is October 31, 2022. Winners in each category will be notified by December 7, 2022.
3. Questions about the competition can be submitted to peer_center@berkeley.edu until October 24, 2022. Questions and answers will be posted on the competition web site and will be updated twice per week.

Contestants

1. Contestants may consist of individuals or teams.
2. An individual can only be involved in a single team.
3. If an individual is part of a team, the individual cannot participate in the competition separately as an individual.
4. The individual or team must declare one of the two categories in the Submittal Spread Sheet
   a. Researchers (including post docs and students)
   b. Practicing Engineer
5. Except for category winners, all submittals will be kept anonymous.
6. Individuals from the University of Trento, UC-Berkeley or other organizations, who are familiar with or has witnessed the tests are not allowed to participate.
7. A representative of the category winners will be invited to the 2023 PEER Annual Meeting that will be held on the UC-Berkeley campus, with reasonable amount of travel expenses covered. The representative will be asked to make a short presentation on the techniques used (model and analysis) in making the winning predictions.

Input Data

1. All input data will be provided under the “Input Data” tab.
2. Provided input data include
   a. Construction drawings and relevant photographs, specifying all necessary geometry, steel member and coupon dimensions, masses, the Impact Mass Damper (IMD) and bumpers, including the initial position of the impact mass before each run.

b. The test matrix that lists the sequence of ground motions (GM).
c. Accelerations measured on the table in units of g without filtering. These accelerations should be used as input to the developed numerical models. Note that the input motions were applied only along a single horizontal direction of the table (Y), however accelerations measured on the table in the two horizontal directions (X, Y) and the vertical direction (Z) are all provided. Depending on their models, the contestants can choose to use only the Y component or all three components.
d. Steel grade of structural members, measured moment-rotation relationships of the clevises, and material properties of the bumpers of the IMD.
e. Identified natural periods and mode shapes of the test structure.
f. Identified damping ratio at the first mode.

Predicted Quantities

1. The participants are required to predict the experimental results obtained from the shaking table tests for 14 ground motions each at the configurations with and without impacting mass. The quantities to predict are:
   a. Acceleration along the shaking direction (Y) at the center of mass of each floor (in units of g)
   b. Base shear along the shaking direction (Y, in units of kN)
   c. Impact force (in units of kN)
   d. Drift of each story along the shaking direction (Y, displacement at the center of mass of the floor – displacement at the center of mass of the lower floor, in units of millimeter)
   e. Top floor displacement (in units of millimeter)
2. Both absolute maximum (MAX) and root mean square (RMS, Eq. 1) values need to be provided for each motion in the Submission file.

$$RMS = \sqrt{\sum_{i=1}^{n} y_i^2} \tag{1}$$

where y_i is the response quantity of interest at time step i and n is the number of time steps. RMS for each GM should be computed considering the duration for each GM provided in the table records.

Evaluation

1. Teams are requested to predict the quantities listed in the provided spreadsheet (Submission_BlindPrediction2022.xlsx). Total number of quantities to be predicted is 28 GM × 8 responses (all except impact force) × 2 (MAX, RMS) + 14 GM × 1 response (impact force) × 1 (MAX) = 462. It is noted that only the absolute maximum (MAX) of impact force needs to be predicted only for 14 GMs
2. For each quantity, error is defined as the absolute value of the difference between the measured value and the values predicted by the contestant.
3. For each quantity,
   a. The team with minimum error in a question will receive 8 points
   b. The second team will receive 5 points
   c. The third team will receive 3 points
   d. The fourth team will receive 1 point
4. For each quantity, received points will be multiplied by the corresponding weights (Table 1) and all the weighted points for the 476 quantities will be added up and the team with the largest total will be declared the winner of this category.

Table 1. Weights of different response parameters used in the evaluation

Response	**Weight**
Each Floor Acceleration	2
Base Shear	1
Impact Force	3
Each Story Drift	1
Top Story Displacement	1

5. If there are sufficient (based on the judgement of the evaluation committee) participants in each category, there will be one winner for each of the two categories. Otherwise, no distinction will be made between the two categories in announcing the winners. Awards will be given in a special ceremony at the 2023 PEER Annual Meeting.
6. The organizing committee will continue to work with interested participants after the contest is completed, for model updating to match the experimental results.