

## High Performance R/C Structures

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### Specific research challenges to be addressed:

#### Societal requirements to be addressed:

- Include new visions from Tohoku earthquake
- Next Tokai, Nankai earthquake (to prevent devastation in Tokyo, Yokohama, Nagoya, etc.)
- Need to consider existing building stock (because study would have largest impact on existing structures)
- Retrofit (enhance structural performance of existing buildings)—might use normal damper assuming retrofit and can assess impact of retrofitting using damper
- Balance of cost and performance
- Design philosophy

#### Improvement of design practice:

- Damage assessment
- Identification of mechanism of moment-frame system (MFS) – important for even damage assessment because of maximum story drift, and collapse capacity
- Complete mechanism with improved wall (i.e., conventional well-designed wall)
- Philosophy of design can be topic for new test specimen.
- There will be one test structure, but have two directions...therefore can investigate some different system in the two directions

#### New material and technology:

- High-strength concrete member (use of both HSC and NSC for low-rise building to be considered)
- Precast concrete member
- Fiber concrete (relatively new material, hard to handle)
- Unbonded prestressed member (classified as new technology)
- Dampers (mature device...if connected to normal RC structure can reduce maximum deformation, such that achieve damage resistant structure...realistic goal even now).
- *Came up with stiff low-rise system with NSC...might generate strong, elastic system. Simple and accessible.*

#### Monitoring and numerical analysis:

- Verification of capability (check structural performance...can verify capability of current monitoring technique...or simulation)
- Development of new method (in terms of monitoring—new method rather than verification)

- Numerical analysis could provide preliminary preparation for design...Valuable to compare E-Defense test with component test...if element is tested already or in near future—if they are incorporated in the test system...that would be valuable to analyze the E-Defense test data.

### **Givens:**

Plan to test ten story structure

Two directions can be different (e.g., walls in one direction, frames in the other direction)

Interested in new technology as well as performance of existing building stock. As such may use “new” technology for retrofit and assess performance (e.g., dampers or BRB)...then remove the retrofit and retest the structure in its as-built condition.

These tests would benefit both assessing “new” technology as well as assessing the current building stock

Time frame:

- Component tests to be conducted in 2012 prior to E-Defense test
- The next test will be held in 2013...it will be completed in October of 2013
- Final design in February 2013
- Bid for construction in March 2013
- Final plan for measurement in June 2013
- Bid for measurement July 2013
- Measurement instrumentation September 2013
- E-Defense test October 2013

### **Desired collaboration:**

Use of NEESR facilities for component tests (Japanese colleagues can partner with US colleagues).

Current opportunity to integrate proposed features of E-Defense test in NEESR Rocking Wall project, in addition to writing new proposals due in November 2011.

Opportunities for payload projects on the E-Defense structure. Although the details are not finalized, NEESR proposal writers can consider the plans of the 2010 tests in terms of structural elements and testing protocol as being typical.

NEESR policies in terms of data sharing to broader public of 12 months would apply to projects conducted at NEES sites with NSF funding.

Face-to-face collaboration meetings are important to facilitate free and open discussion. Should plan to coordinate at upcoming meetings and conferences with web-ex conferences between that have specific agenda items.

### **Societal and scientific benefits of collaboration:**

Design philosophy of existing building stock is somewhat different between Japan and the US...however...can assess and develop numerical models.

Through shared information on design philosophy may move towards improving the designs in both countries.

Both countries will benefit from development of resilient structures. Both countries have a large building stock that can benefit from improved robust retrofitting techniques.

*Advertisement for blind prediction contest:*

Blind prediction contest on E-Defense 4-story RC&PT Building Blind Prediction Contest

[http://peer.berkeley.edu/prediction\\_contest\\_2011](http://peer.berkeley.edu/prediction_contest_2011)

Sept. 7 submittal of pretest analysis

Sept. 20-21 test dates