Meeting 7 of the BSSC PUC Issue Team on Shear Walls
Web Meeting
November 6, 2017: 1p – 2.15p Pacific Time

Notes

1. Call to order

Ghosh called the meeting to order at 1:05 PM Pacific Time.

2. Roll Call
Leigh Arber (AISC, filling in for Bonnie Manley), Jeff Berman, David Bonneville, Michel Bruneau, Anindya Dutta, Joe Fierzli, S. K. Ghosh, John Hooper, Gino Kurama, Phil Line, Rafael Sabelli, Andrew Taylor, John Wallace (joined for last few minutes of meeting), Jiqiu Yuan.

3. Opening remarks
Ghosh noted that the committee has been making progress in several areas.

4. Notes on face-to-face meeting of August 15-16, 2017
This meeting was held in Seattle. Taylor and Ghosh collaborated on the minutes of the meeting. A major outcome of this meeting was the development of a draft outline of the planned committee document.

5. An update on a P-695 study to justify a proper $R$-value for a ductile reinforced concrete coupled wall system

Ghosh reviewed materials sent by Wallace.

Wallace and his colleagues are working on this P-695 study. The study has an independent advisory group which has been appointed by the PUC of BSSC. There is also a separate advisory group representing ACI 318, ACI 318H, and the Pankow Foundation.

Wallace sent an outline of tasks that they have been working on. Ghosh reviewed this list of nine items. Wallace said (via email) that an initial meeting of the P-695 advisory committees has been scheduled for Friday, November 10. He asked if this committee has any input on
   1. Ground motions
   2. Prototype design
   3. Nonlinear modeling and failure modes
   4. Archetype space
Ghosh noted that if any members of this committee have additional input for John Wallace they should send their ideas directly to John before the scheduled advisory committee meeting.

6. P-695 studies of other coupled wall systems

Ghosh received information about a FEMA P-695 study that is being carried out by researchers at the University of Cincinnati. Hooper noted that he originally forwarded this information to Ghosh so that, if possible, the two P-695 studies could be coordinated. Also now underway is a FEMA P-695 study of a coupled composite steel plate shear wall system, being conducted by Bruneau and his colleagues.

Ghosh said that all three studies are now going on at about the same time. The studies may not be completed at the same time, but hopefully they will be completed by the time this committee needs to complete its work. Bruneau asked when that time is. Bonneville responded that the limitation is set by timing for submittals to ASCE. Ghosh said that this committee should complete its work by the end of 2018. Bruneau requested that a copy of the various milestones should be distributed as a table to members of this committee. Yuan will send this schedule to Ghosh. [The schedule was subsequently forwarded to IT4 members].

7. Update on coupled reinforced concrete shear walls – Fields/Taylor

Ghosh noted that a proposal is under consideration by ACI 318 Subcommittee H to define a ductile coupled shear wall. There were several comments during the ACI balloting, which were mostly resolved, but there remain one or two significant items to be worked out.

Fields made a brief presentation on the status of the definition of a ductile coupled shear wall. He described changes in the definition that are intended to prevent “gaming of the system” by creating coupled walls that have unacceptable configurations. For example, two tall, slender walls joined by one coupling beam would be unacceptable. Similarly, two wide, squat walls connected by one coupling beam would be unacceptable. The proposed definition includes limits on the ratio of total length of coupling beams to total length of shear walls.

Bruneau wondered if the strength of the beams and walls should be included in the definition. Several committee members commented that this might make the definition unwieldy. Fields said that he could have a preliminary suggestion for limits on the ratio (length of beams)/(length of walls) in a couple of weeks.


Ghosh displayed the draft outline for attendees to review. He discussed each line of the outline, and the status of assigned tasks. He noted that the introductory sections are
intended to be quite brief, and to describe the essence of the mechanics and design approach for each type of shear wall.

1b. A “mechanics” of shear walls draft has been submitted by Sabelli and Taylor.

1c. Kurama may make some revisions to the draft sections on precast concrete walls that he already submitted.

2c. Ferzli said that he is working on his section, and expects to have a draft within a month.

2d. Fields is working on his section on deformation demands in slender shear wall buildings.

2e. Ghosh and Fields have made some progress on this section on classification of reinforced concrete shear walls and will have a draft before the January meeting.

2f. Shear design of RC shear walls involves some very important sections. Some are under way, while others have not been started.

2g. Axial load overstrength – Lehman is working on this.

2h. Detailing of special shear walls will focus on general principles. Anything covered by ACI 318H will not be addressed by IT4.

3. Masonry Shear Walls: Bennett has provided a detailed writeup.

4. Steel plate shear walls: Berman sent some preliminary materials to Ghosh. These relate to the introduction of the steel plate shear walls section.

5. Wood shear walls: Line reported that not much progress has been made because there are some uncertainties about the current state of practice.

For examples item 5a “Methods for computing deflections in stacked shear walls” is addressed by a SEAOC example problem. However, there is also the so-called “rational approach” from Canada. This method results in deflections that are approximately twice as great as the deflections predicted by U.S. methods.

Regarding 5b “Combined compression and shear failures in shear walls” Line and Cobeen are trying to determine if there is a behavior in wood walls that is analogous to the observed behavior in concrete shear walls.

Regarding 5c, “Capacity-based design” Cobeen is studying this issue. They are awaiting some additional ATC study results that may assist with their work.
Line noted that oftentimes wood shear walls have been tested without applied vertical gravity loads. This was generally done because it represents a conservative condition. However, this gives a pessimistic view of the overall shear strength of wood shear walls. Testing is planned for 2018 or 2019 to address this concern. Line also noted that framers typically try to place nails at the center of framing members. However, much testing is done with nails right at the edge, which is non-compliant with regard to nail placement. This creates another layer of conservatism that is detrimental to the calculated capacity of wood shear walls. Ghosh encouraged Line to write down all of these thoughts for inclusion in the committee report.

Ghosh returned the discussion to the topic of combined compression and shear failures in wood shear walls. The idea is that the combined effects of compression and shear may be worse than the sum of the effects of compression and shear considered separately. When a concrete shear wall is subject to a high shear load, a compression strut forms in the panel to resist shear. This effect is combined with the compression in the vertical compression boundary of the wall. It was felt that the same is unlikely to happen in a wood shear wall.

9. Other business

Bonneville had a general question about scoping of the committee’s work. He has counted several newly-proposed coupled wall systems, and come up with six:
   1. Classic coupled concrete shear walls
   2. Coupled composite steel/concrete walls (Bruneau)
   3. Concrete walls coupled with steel coupling beams (University of Cincinnati)
   4. Coupled steel plate shear walls
   5. Coupled masonry shear walls
   6. Coupled wood frame shear walls

Ghosh said that we are probably only going to cover two types of coupled walls: concrete shear walls coupled by concrete or steel coupling beams and coupled composite steel/concrete walls. There is not enough interest in the other types to pursue developing design rules for them.

10. Next meeting – January 23 (9.00a – 6p) -24 (8a – 12.00n), 2018 (face-to-face, KPFF, Seattle)

Taylor will check on availability of the meeting room, and Ghosh will send out an announcement confirming the final arrangements of the meeting. [The meeting has since been confirmed.]

11. Adjourn

Ghosh adjourned the meeting at 2:15 PM