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Building Seismic Safety Council

FEMA-NIBS BSSC PROVISIONS UPDATE COMMITTEE

Burlingame, CA

August 29, 9am – 5pm, 2017
August 30, 8:30am - 3:30pm, 2017

Summary Minutes

Participants

Provisions Update Committee
David Bonneville, Degenkolb Engineers (Chair), August 29 &30
Pete Carrato, Bechtel Corporation, August 29 &30
Kelly Cobeen, Wiss Janney Elstner, August 29 &30
C.B. Crouse, AECOM, August 29 &30
Dan Dolan, Washington State University, August 29 &30
Anindya Dutta, Simpson Gumpertz & Heger, August 29 &30
S.K. Ghosh, S.K. Ghosh Associates, August 29 &30
John Gillengerten, Consulting Engineer, August 29 &30
Ron Hamburger, Simpson Gumpertz & Heger, August 29 &30
Jim Harris, James Harris & Associates, August 29 &30
William Holmes, Rutherford & Chekene, August 29 &30 (remote call in)
John Hooper, Magnusson Klemencic Associates, August 29 &30
Gyimah Kasali, Rutherford & Chekene, August 29 &30
Charles Kircher, Charles Kircher & Associates, August 29 &30
Philip Line, American Wood Council, August 29 &30
Bret Lizundia, Rutherford & Chekene, August 29 &30
Jim Malley, Degenkolb Engineers, August 29 &30
Bonnie Manley, American Iron and Steel Institute, August 29 &30
Robert Pekelnicky, Degenkolb Engineers, August 29 &30
Rafael Sabelli, Walter P. Moore, August 29 &30
John Silva, Hilti, August 30
Greg Soules, CB&I, August 29 &30 (remote call in)
Jonathan Stewart, University of California Los Angeles, August 29

BSSC Members and Associates
Sandy Hohener, Degenkolb Engineers (IT 2 Chair), August 29

Stephen Harris, Simpson Gumpertz & Heger Inc.(IT 7 Chair) , August 29
John Heintz, Applied Technology Council, August 29 &30
Veronica Cedillos, Applied Technology Council, August 29
David Bonowitz, August 29
Leigh Arber, AISC, August 29 &30
Jon-Paul Cardin, AISI, August 29 &30
Philip Caldwell, SE, August 29 &30
Michael Valley, MKA, August 29
Jennifer Goupil, ASCE/SEI, August 29 &30
Curt Haselton, August 29 (remote call in)
David (Jared) Debock, CSU Chico, August 29
Zia Zafir, Kleinfelder, August 29
Kristi Debock, Digital Path, (with Jared Debock)

USGS
Nicolas Luco, August 29 &30
Sanaz Rezaeian, August 29 &30

NIST
Steven McCabe, August 29 &30

FEMA /NIBS
Mai Tong, FEMA, August 29 &30
Michael Mahoney, FEMA, August 29 &30
Robert Hanson, University of Michigan, August 29 &30
Andrew Herseth, August 29 &30
Philip Schneider, NIBS/BSSC, August 29 &30
JQ Yuan, NIBS/BSSC, August 29 &30

1. CALL TO ORDER.

David Bonneville opened the meeting at 9:00 a.m. with member introductions, a reading of the anti-trust statement, and a review of the agenda (see Attachment No. 1).

Mai Tong from FEMA welcomed everyone.

2. 2020 NEHRP Schedule

David revisited the 2020 NEHRP Provisions Schedule. Mai Tong stated that FEMA can extend the current 2020 cycles by one year if needed to provide PUC members more time to prepare proposals. Jennifer Goupil and John Hooper stated that the ICC has moved ASCE 7 to group B, which means ASCE must have the complete documents by 2022. David Bonneville, Ron Hamburger, John Hooper, Jennifer Goupil, Philip Schneider, and JQ Yuan will schedule a follow up tele-conference to coordinate the schedules of NEHPR Provisions and ASCE 7-22. David will update PUC with new schedule in November PUC meeting.

3. BSSC Activity Updates (Attachment 2)

JQ Yuan updated the committee on BSSC outreach activities, including a series of construction materials webinars based on the 2015 NEHRP Provisions (and more webinars for next FY), and FEMA sponsored BSSC Sessions at the 2017 SEAOC Conference, the 2017 NCSEA Summit, 2018 Structures Congress, and the 2018 11NCEE Conference. JQ informed the committee that most up-to-update activities, including the PUC, Project 17, Issue Team and Work Group membership, main committee and sub-committee meeting minutes, publications, webinars, etc. can be found at the BSSC website, https://www.nibs.org/?page=bssc (or simply Google "BSSC"). After a quick introduction on the new BSSC ballot system, PUC affirmed that it generally likes the simplicity and user-friendliness of the new system. One comment from the committee was that, instead of having "save" (save for later edits) and "submit" (submit for final vote) buttons, the vote and comments should be automatically submitted by the system at the end of voting period.

4. PUC Ballot 1 on adopting ASCE 7-16

Ballot No. 1: Adoption of ASCE 7-16 as the basis for 2020 NEHRP Provisions

Scope: Review the seismic requirements of ASCE/SEI 7-16 and adopt ASCE/SEI 7-16 as the primary reference standard, with exceptions and modifications, for the 2020 edition of the Provisions.

Results: Approved by PUC. Sixteen members voted with 14 voting yes and 2 voting yes with reservations, which suggested that the errata was not incorporated into the first printing of ASCE 7-16. David sent the latest errata to PUC members before the meeting.

The next step is to get BSSC Board approval and conducting a Member Organization ballot.

5. ASCE Update and the Code Correlating Committee

- ASCE is forming the committees, which are supposed to have their first meetings sometime in October, 2017. There are some efforts within ASCE to look at code simplification.
- There is likely to be a Supplement-1 to ASCE 7-16, mainly affecting Chapter 21 in seismic chapters. John Hooper mentioned that there are fewer technical than implementation issues. The intent is to have the Supplement be adopted in IBC 2021.
- The PUC will serve as the Code Correlating Committee, which was the practice for the last cycles.

6. P17 Report, Ron Hamburger (Attachment 3)

- **Acceptable risk:** Retain the Project'07 risk model, and redefine but retain the "characteristic" earthquake. Commentary will be prepared to describe the rationale behind this.
- **Deterministic Earthquake**: Still needed. The Deterministic Work Group under P17 will come up with recommendations in next P17 meeting.

- **Yo-Yo effect:** looked at ways of smoothing ground motions changes with code editions. Two options are under consideration: (1) reduce significant figures, (2) use a weighted average approach (with multi period spectra starting from this cycle, using weighted averages might start in the next cycle). It was pointed out that minor (+/- 15%) changes in ground motion values are annoying but not generally problematic, switches in SDCs are more problematic.
- **Stabilizing SDCs:** Looked at options of a map tied to ground motion values for default site class, with the PUC using judgement to move SDC boundaries or not. There is a possibility of publishing separate maps for SDCs, but no consensus yet. The work group will continue its efforts going forward.
- **Multi-point spectra:** Possibly publish separate maps by SDC, providing spectral values at multiple periods including site class effect
- Effect of **Long Duration Shaking:** This effort, led by John Hooper, might generate Part 3 recommendations.

7. Pending updates of USGS National Seismic Hazard Model (NSHM), Nico Luco

- A draft of the 2018 USGS NSHM will be completed by Q1 of 2018. Output will include additional spectral periods (including longer periods) and site classes. The draft of the 2020 NSHM will start mid-2018. The updated NSHM will be developed with new software and disseminated with a new web tool (URL will not be the same all the time, tips to find the tool, Google "USGS Hazard tool"). (Attachment 4)

- Changes to the USGS Seismic Design Tools: The "current" tool will not be in place in the future due to the perennial shortage of USGS web developers and the availability of ASCE's new "hazard" tool (https://asce7hazardtool.online/). USGS is replacing the current web tools with corresponding web services to support ASCE's and other new seismic design tools and support a broader base of users. (Attachment 5)

8. IT 1 report, Bob Pekelnicky (Attachment 6)

- Non structural performance: Bob provided an update on ATC 120 Phase 2 to create explicit performance requirements for nonstructural components.
- Function Protection Performance Objective:
  - Do our provisions in Chapters 12, 13, 15 and 16 meet this objective?
    - ✓ Potentially in Chapter 12, but not for all structural systems.
    - ✓ Chapter 13 might be providing this, contingent on equipment certification.
    - ✓ Chapter 15 requirements are very dependent upon other standards.
    - ✓ Issues with Chapter 16 not requiring evaluation at the DE.
  - Should we be extending these requirements to Risk Category III for lower hazard intensity or reliability? No consensus within the issue team yet.
  - Should we have such requirements for Risk Category II for lower hazard intensity or reliability? Probably not.
  - *Next Step: Identify gaps in Chapters 12, 13, and 15, develop provisions for DE evaluation in Chapter 16, and assess appropriateness of using 2/3*MCE_R as function hazard for Risk Category IV.*

- Should we recalibrate design in Chapters 12 and 15 to be based on MCE_R?
  - Stated reasons to change and not change
  - *With the decision from P17 that the committee won't change the definition of MCE_R, it seems that it is unneeded and unwanted to recalibrate in Chapters 12 and 15 (and make Chapter 16 more complicated)*
- Should we de-couple the Design Earthquake from the MCE_R?
  - *Depending on the output of P17 on the definition of MCE_R. Will revisit in next IT 1 meeting.*
- What should the "Design Earthquake" be for Nonstructural components?
  - *ATC 120 may not have a strong desire for a design earthquake other than 2/3 MCE_R.*
- Seismic Design Categories (Ron Hamburger, Attachment 7).

  Summary of the current preliminary study (the team will discuss more and come up with recommendations):
  - Current SDC boundaries map reasonably well to high confidence of having:
    – SDC A – MMI V - maximum
    – SDC B – MMI VI - maximum
    – SDC C – MMI VII - Maximum
    – SDC D – having MMI VIII or higher
  - Recent evidence suggests that MMI VI and lower, there is no need to provide seismic protection
  - For MMI VII – probably need to protect against cantilevered parapets, chimneys and nonstructural hazards
  - MMI VIII and above design for earthquake like you mean it
- Resilience design (David Bonowitz, Attachment 8).
  - *Part 3 paper. The committee supports a Part 3 paper. Will see some outlines in November 2017 meeting.*

9. IT 2 report, Sandy Hohener (Attachment 9)

- Ongoing efforts
  - ATC-123 (Configurational Irregularities), based on ATC 123 results, will develop part 1 proposals
  - Direction combination: looking at more data points, including an introduction of Henry Burton's research. The issue team probably will only look at median response. Critical systems like corner columns may be handled by material standards. Members of PUC suggest it may be more appropriate deal with systems instead of material specific. May hold off till Henry Burton's research is done. Potential proposal.
  - C_d=R. Sandy responded the comments from last PUC meeting as to why the change of C_d=R is warranted. Potential proposal, which also largely depends on IT 1 outcome. The team will consider proposing Cd = R with respect to specific code provisions (within Chapter 12 and possibly within Chapters 13 and 15) instead of making Cd = R within Table 12.2-1.
- On Hold
  - Bearing Wall Definition
  - Height limits & PBD

10. ATC 123 report, Michael Valley and Jared Debock (Attachment 10)

Objective is to calibrate quantitative triggers and related design requirements for irregularities. The definition of irregularity by ATC 123: "an aspect of configuration that, if unaddressed, detrimentally affects a structure's performance during an earthquake leading to an unacceptable reduction in collapse safety or increase in damage." Some research areas include (see more details in the attachment 10):

- Address irregular levels only
- Identify elements subject to overstrength design
- Adjust triggering dimensions
- Use of ELF is appropriate in some cases, sometimes even more conservative
- Term clarifications
- Study effects of torsional irregularities. Summary of findings: current ASCE 7 design provisions for torsionally irregular buildings work well, but are conservatives; based on the study, we could eliminate prohibition of extremely torsionally irregular buildings in SDC E and F and reduce accidental torsion amplification and soften triggers for ρ =1.3.

There will be proposals based on the torsional work, probably submitted by IT 2.

11. IT 3, Anindya Dutta (Attachment 11)

- For the 9, 6, and 3-story moment frame buildings studied by the group, it is concluded that for the range of buildings included in this study, not much difference in prediction of drifts for R-uniform vs. R 1st mode only
- Completed the moment frame study with a 20 story building.
- Studied BRBF buildings, 9, 6, and 3 stories. not much difference in prediction of drifts for R-uniform vs. R 1st mode only
- Next Step: Study of irregular buildings.
- Based on current study, not much difference in prediction of drifts for R-uniform vs. R 1st mode only. Main difference is to use R or C_d to scale.

Comments: probably should look at concrete shear wall buildings.

12. IT4, SK Ghosh (Attachment 12)

- Issue Team 4 Meetings:
  - August 29-30, 2016, in-person meetings
  - November 2-3, 2016, in-person meetings
  - April 3, 2017, web meeting
  - May 12, 2017, web meeting
  - June 29, 2017, web meeting
  - August 15-16, 2017, in-person meeting
- Part I proposal: will propose modifications to ASCE 7-16 table 12.2-1
- Concrete shear walls coupled shear walls
  - Definition based on overturning moment
  - Definition based on energy dissipation-based definition
  - ACI 318-14 Section 2.3 terminology (have been balloted by ACI 318H)

- To gain acceptance by ASCE 7 into the R-factor table, a P695 study is required. *SK will reach out to John Wallace to suggest PUC peer review panel (Ron Hamburger, Charlie Kircher, Steve McCabe, and Anindya Dutta) besides the advisory committee of P695 study.*
- *Comments from the PUC: There need to be a reasonable amount of coupling between the wall sections. John Hopper, MKA, will look at the optimal coupling. John Silva suggested look at anchorage/connection (headed bar) of coupling beam.*

- Part III resource paper on coupled shear wall: have developed tentative outline and authors for each chapter have been assigned. A few areas mentioned include:
  - Concrete shear walls wall configuration
  - Concrete shear walls deformation demands in slender shear wall buildings
  - Classification of reinforced concrete shear walls
  - Shear design of reinforced concrete shear walls
  - Masonry shear walls: develop recommended improved detailing requirements, 15-page White Paper by Richard Bennett on partially grouted masonry shear walls, 7-page White Paper by Richard Bennett on coupled masonry shear walls. Suggest future research on ductility, and joint improvements
  - Steel plate shear wall: The 2016 ASIC 342 seismic provisions for steel plate shear walls result in a very inefficient design. The optimal design might reduce steel weight by 40 to 50%
  - Coupled steel plate shear walls: Objective (1) Comprehensively characterize behavior and performance of SPSW-WC system, (2) Develop guidelines. Most likely a part 3 paper (need funding to conduct P695 study)
  - Composite couple steel plate shear walls: AISC is planning to develop a part I proposal on couple steel plate shear wall.
  - Wood Shear walls: collaboratively considered by IT4 and the AWC Wood Design Standards Committee and/or its seismic task committee. Comments on ongoing study on glued shear wall, maybe a topic for the issue team.
- There will like be Part 1 proposals on concrete coupled shear wall and composite coupled steel shear wall. All the rest likely will be part 3 resource papers.

13. IT5, John Gillengerton (Attachment 13)

Scope: Address issues that significantly influence the performance of nonstructural components and develop proposals/issue papers based on ATC 120 project:

- A 90% draft of the ASCE 7 Chapter 13 "roadmap" developed by WG1 of the ATC-120 project is currently being reviewed by IT5
- In the process of forming 3 subgroups in IT5 to develop proposals based on the recommendations of the ASCE 7 "roadmap"
  - Revise the scoping of the nonstructural design provisions to clearly identify components subject to the seismic design requirements
  - Clarify the qualifying conditions for exemptions to the seismic design requirements
  - Provide definitions of "permanently attached" and "movable" components.
  - Provide provisions for selecting the Seismic Design Category for components that are associated with but not structurally attached to Risk Category IV structures

- Limitations on the use of nonductile materials and systems in nonstructural components, supports and attachments
- Develop a method of classifying items as nonstructural components versus nonbuilding structures, a joint effort with IT6, Nonbuilding Structures.
- Develop a proposal in conjunction with IT6 Nonbuilding Structures to clearly identify those items to be designed as nonstructural components and those to be designed as nonbuilding structures.

- IT5 consideration of the force equations for nonstructural components will begin once the recommendations from ATC-120 WG3 are finalized
- Component Design Group will fill in some of the gaps in ASCE 7 chapter 13
  - Develop methods for estimating nonstructural component displacements and criteria for accommodating these displacements
  - Expand the commentary for nonstructural components such as architectural cladding panels, where additional context is needed for the design requirements
  - Develop provisions for architectural components that are assigned design coefficients but are not discussed in Chapter 13
- ATC 120 WG 3 is evaluating ASCE 7 nonstructural design equations and exploring alternative philosophies for non structural design (Bret Lizundia).
  - Significant parameters being considered:
    - ✓ Ground shaking intensity: Major
    - ✓ Component stiffness: Major
    - ✓ Building structural system type/stiffness: Moderate
    - ✓ Building structural system ductility: Major
    - ✓ Vertical location of component: Major
    - ✓ Component ductility: Major
    - ✓ Building damping: Not significant at DE
    - ✓ Component damping: Major
    - ✓ Other issues under consideration: vertical irregularities, plan irregularities (torsion), diaphragm flexibility, Ωo anchorage factor, capacity-based design for nonstructural components
    - ✓ Current form of equation
    - ✓ Ongoing studies: Level of uncertainty in the design equations

    Comments: (1) have the team considered component redundancy? (2) Align force demands in chapters 13 and 15 so that the main difference between the chapters is the rigor of the analysis.

14. IT6, Pete Carrato (Attachment 14)

- Proposed new provision on Corrugated Steel Liquid Storage Tanks
  - PROPOSAL IT 6-1 Rev. 0-2017-03-17. Expected to be balloted before next PUC meeting.
- Distributed Systems
  - Conveyors, duct work, piping, (overlap with IT 5, will have a joint in-person meeting with IT 5)
- Tee head pipe supports
  - Proposal by Rick Drake

- Fiberglass cooling towers
  - PROPOSAL IT 6-2 Rev. 0-2017-07-10 *NEW*. Expected to be balloted before next PUC meeting.
  - Very popular structures, ASCE is developing draft standard, will seek input from Cooling Technology Institute.
  - Proposed revision, R=2, Ω_0=2, Cd=2. Maybe R =3, need field testing (and funding).
- Large Concrete Machine Foundations, ongoing.
- Cast-in anchor bolts, ongoing.

15. IT 7 report, Steve Harris

IT 7 made significant progress on two of their tasks:

- Revisions on Chapter 19, Bob Pekelnicky (Attachment 15)
  - Eliminate all conservative KSSI limits for NLR and use original proposed 50% limit.
  - Revise BSA & Embedment to eliminate 0.75.
  - Retain the end limit on design force reduction

- Seismic pressures on retaining walls, Jon Stewart (Attachment 16)
  - Replace resource paper 12 (2009 Provisions) with a new one or prepare a new resource paper on this topic. Not part 1 changes.
  - May recommend two procedures: Inertial and kinematic (can be combined).
  - PUC favors the effort and suggest moving forward. Comments: make it simple for practice engineers (guidelines where this needs to be checked).

16. IT 9 report, Kelly Cobeen (Attachment 17)

- Started drafting RWFD proposal and will have a draft for November meeting
- Control the scope on the building plan configuration that the team has a handle on
- Scope item 2 on Diaphragm alternate design: new parameter R_s being discussed.
- Ongoing steel deck diaphragm related research: monitor on the progress and look at possibilities to incorporate with the issue team work.

17. Project specific, Jim Malley (Attachment 18)

Propose new guidelines in ASCE Chapter 12 and 16 to foster innovation.

- Present Section 12.2.1.1 focuses on system vs. individual buildings
- Better approach might be to encourage engineers to try new ideas and see if they gain acceptance (BRB's, e.g.), BEFORE going through the FEMA P695 gauntlet
- Proposed New Section 12.2.1.2 – "Project Specific Structural Systems"

Comments: AISC has similar standards allowing innovative systems. PUC suggested moving forward and this will be a ballot item. The effort may not be limited to Ch 12, may also include Chapter 15.

18. Ch 24 update, John Hopper

- Report is complete, which includes three chapters, 1. Introduction, 2. Provisions (update to ASCE 7-16), 3. Recommendations. It will be a FEMA P-1091 publication. It won't be reviewed by the PUC
- This won't be included in the 2020 NEHRP Provisions.
- In long term, with electronic version of future standards, updating the documents to correspond with latest version of ASCE 7 probably may not be an issue.

19. 2015 Provisions –ASCE 7-16 comparisons:

- Chapter 12, SK Ghosh(Attachment 19)
- Chapter 16, Curt Haselton (Attachment 20)
- Chapter 19, Bob Pekelnicky, PUC recommended more aggressive site kinetic factor
- Site Specific Requirements, Charlie Kircher

20. Adjourn

The meeting adjourned at 3:30 pm on August 30, 2017.

Future PUC meetings:

- PUC meetings: 11/29-30, 2017 (no P17 meeting).
- PUC meetings: 4/4-5, 2018 (4/3/2018, P17 meeting).