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**BUILDING SCIENCES**  
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## **Building Seismic Safety Council**

### **FEMA-NIBS BSSC PROVISIONS UPDATE COMMITTEE**

**San Francisco, CA**

**November 29, 9:00am – 5:00pm, 2017**

**November 30, 8:30am - 3:30pm, 2017**

*Summary Minutes*

#### **Participants**

##### *Provisions Update Committee*

David Bonneville, Degenkolb Engineers (Chair), November 29 &30

Pete Carrato, Bechtel Corporation, November 29 &30

Kelly Cobeen, Wiss Janney Elstner, November 29 &30

C.B. Crouse, AECOM, remote call in on November 29

Dan Dolan, Washington State University, November 29 &30

Anindya Dutta, Simpson Gumpertz & Heger, November 29 &30

S.K. Ghosh, S.K. Ghosh Associates, November 29 &30

John Gillengerten, Consulting Engineer, November 29 &30

Ron Hamburger, Simpson Gumpertz & Heger, November 29

Jim Harris, James Harris & Associates, November 29 &30

William Holmes, Rutherford & Chekene, November 29 &30

John Hooper, Magnusson Klemencic Associates, November 29 &30

Gyimah Kasali, Rutherford & Chekene, November 29

Charles Kircher, Charles Kircher & Associates, November 29, remote call in on 30<sup>th</sup>

Philip Line, American Wood Council, November 29 &30

Bret Lizundia, Rutherford & Chekene, November 29 &30

Jim Malley, Degenkolb Engineers, November 29 &30

Bonnie Manley, American Iron and Steel Institute, November 29 &30

Robert Pekelnicky, Degenkolb Engineers, November 29 &30

Rafael Sabelli, Walter P. Moore, November 29 &30

John Silva, Hilti, November 29 &30

Greg Soules, CB&I, November 29 &30

Jonathan Stewart, University of California Los Angeles, November 29 &30

##### *BSSC Members and Associates*

Sandy Hohener, Degenkolb Engineers (IT 2 Chair), November 29 &30

Stephen Harris, Simpson Gumpertz & Heger Inc.(IT 7 Chair) , November 29  
Jason Collins, PCS Structural Solutions, Corresponding member, November 29 &30  
Leigh Arber, AISC, November 29 &30  
Jon-Paul Cardin, AISI, November 29 &30  
Larry Kruth, AISC, November 29 &30  
Philip Caldwell, SE, November 29 &30 (remote call in)  
Jennifer Goupil, ASCE/SEI, November 29 &30 (remote call in)

#### *USGS*

Nicolas Luco, November 29

#### *FEMA /NIBS*

Michael Mahoney, FEMA, November 29 &30  
Robert Hanson, University of Michigan, November 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 (Attachment No. 1).

Michael Mahoney from FEMA welcomed everyone.

### **2. Approval of PUC August 29-30, 2017 Meeting Minutes.**

The minutes were approved unanimously. The meeting minutes and attachments are posted on BSSC website. [https://www.nibs.org/?page=bssc\\_PUC](https://www.nibs.org/?page=bssc_PUC)

### **3. 2020 NEHRP Schedule**

David Bonneville updated the committee on the revised 2020 NEHRP development schedule (included in Attachment 1). The last set of proposals will be around first quarter of 2020 to give enough time for PUC and BSSC Member Organizations' ballot and to be considered by ASCE 7 Seismic Subcommittee.

### **4. BSSC Activity Updates (Attachment 2)**

Philip Schneider updated the committee on a ASCE/SEI 7-16 Adoption report being prepared, which will summarize the first ballot of adopting ASCE/SEI 7-16 for the 2020 cycle; provide information on the general NEHRP Provisions development process, and the relationship between the NEHRP Provisions and national standards and model codes and, describe some of the important changes to ASCE 7-16 proposed in the 2015 NEHRP Provisions.

JQ Yuan updated the committee on BSSC outreach activities, including a series of online on-demand training courses based on the recorded webinars in 2017 ([https://www.nibs.org/?page=bssc\\_webinars](https://www.nibs.org/?page=bssc_webinars)) and upcoming FEMA/BSSC Sessions at the 2018 Structural Congress and 11<sup>th</sup> NCEE conference.

A few new features on the BSSC ballot system were introduced:

- During the voting period, committee members can always go back to the system to edit their votes and comments, and **the system will automatically submit the draft ballot when the ballot closes.**
- A report showing a comprehensive list of the ballots that the committee members have voted on.

#### 5. USGS National Seismic Hazard Model (NSHM) Update, Nico Luco (Attachment 3)

- USGS will stage a workshop on the draft NSHM on March 7-8, 2018. **The draft NSHM will be shared with PUC in the beginning of 2018.**
- Possible 2018 NSHM updates:
  - NGA-East Ground Motion Models: will include 13 independent models with assigned weights and sigma (vs no assigned weights and sigma before). In most cases the magnitude of change is less than 0.1g.
  - Basin Effects: The current national map includes basin effect in a limited number of regions but not all. The 2014 USGS maps (adopted in the ASCE 7-16) used default basin effects across the country, then values were adjusted for some regions with known significant basin effects.

The new 3-D model (using an actual basin depth) could change the seismic value (compared with the default basin depth) at 1 sec on the order of 25% or more, and even more at longer periods, on the order of 50% or 100%. It is suggested to make some comparisons in a number of sites in LA and some other locations (spectra based on ASCE 7-16, vs GMPE based approach, which included basin effects and used actual basin depths). **This will be discussed in next P17 meeting in April, 2018.**

- Seismicity catalog (note: Hawaii and Alaska will not be in the 2018 update).
- Induced earthquakes will be treated separately and will not be included in the current seismic maps.
- After 2018, the next update will be in 2020. NGA subduction will not be in the 2018 update, but possibly in 2020 if finished in time.

## 6. Project 17 update, Ron Hamburger (Attachment 4)

Work Group activities were updated as follows:

- Acceptable Risk: Evaluated the current 1% collapse risk in 50 years with deterministic caps, and decided to retain present model, which for this cycle is consider resolved.
- Deterministic Caps: Currently using median + 1 sigma motion given the characteristic event, though recent UCERF 3 research eliminated the concept of characteristic events. Two approaches under considerations:
  - Select a catalog of “maximum considered events” by deaggregating the hazard near major active faults at selected return periods;
  - Variable risk. Use gradations of “acceptable collapse risk” ranging from 1%-50 year to something higher at the fault. A P17 web meeting was scheduled for January 30, 2018 to discuss this option.
- SDC: The goal is to bring stability by minimizing the tendency of some regions to go in and out of an SDC as design values go up and down.

**Proposal:** The Work Group is preparing a proposal to map SDC, rather than having users determine their own category. The PUC would review maps from cycle to cycle, to see if changes in SDC areas are significant, or needed. Progress to date includes:

- A single SDC depending on default site classes (though not the same site class everywhere across the country) which will produce the worst ground motion.
  - Seismic design categories, the group are assuming the same as they are today (section 11.6). PUC IT 1 is working on this.
  - SDC boundaries will be considered.
  - Map development rules developed with general consensus: 1. Significant potential benefit in the SDC map; 2. Site-specific data will not override SDC mapped values; 3. The initial SDC map will be based on ASCE 7 rules and NSHM values in effect; 4. An Averaging Approach on the ground motion values does not make sense at this time.
- Multi-Period Spectra: Reported separately by Charlie Kircher (item 7).
  - Long-Duration Motions: Ongoing, but probably no part 1 proposal in this cycle

## 7. Multi-Period Spectra, Charlie Kircher (Attachment 5)

The work group met on November 7, 2017 and draft proposals on multi-period spectra were discussed.

- Chapter 11-Design Ground Motions
  - Retain the 3-domain definition of the design response spectrum
  - Delete site coefficient tables (site effects to be included in USGS maps)

- Revise site-specific ground motion procedures back to ASCE 7-10
- In the Seismic Design Category (section 11.6), replace  $S_1$  with  $S_{M1}$  for determining SDC E and F.
- Chapter 20-Site Class Definitions
  - Revise definitions/criteria to include three new site classes, BC (reference rock), CD (very stiff soil), and DE (soft soil). The terms will be further discussed.
- Chapter 21-Site-Specific Requirements
  - Revise the deterministic  $MCE_R$  floor
  - Revise the 80% lower-bound limit to be based on multi-period design spectrum
- Chapter 22-Ground Motions Parameters Maps
  - Provide mapped values of  $S_{MS}$  ( $S_{DS}$ ) and  $S_{M1}$  ( $S_{D1}$ ) for “default site” (worst case) conditions only (provide all mapped parameters via a web-based app).
- Site effect included, default site class (worst case of CD, DE, EF).

Technical issues:

- Define number and values of “standardized” response periods and site classes. Twenty-one response periods and nine site classes are currently proposed.
- “Science” must be augmented with judgement for some non-Western US sites with incomplete hazard data. It is possible to create a general multi-period spectra shape from NGA West 2 study based on  $S_s$  and  $S_1$  information, but this can take a lot effort. In the past, we didn’t always fill the blanks. For places with a lack of complete hazard data, they may be referred back to ASCE 7-16.
- No commentary (nothing to refer to). Will PUC vote on it w/o commentary? May use a SEAOC paper. P17 will vote on the proposal first.

A P17 web meeting was scheduled on January 29, 2018 to review the proposals.

## 8. Review of 2020 PUC Ballot Procedure (Attachment 6)

The procedure is attached.

## 9. IT 1 Seismic Performance Objectives\_Bob Pekelnicky (Attachment 7)

After reviewing the IT 1 scope, it was reported that the work group on Design for  $MCE_R$  instead of  $2/3 MCE_R$  to calibrate Chapter 12 and 15 was eliminated since there are no compelling reasons to make changes. Other IT actions are as follows:

- Seismic Design Category: The group will attempt to have a ballot on the change of SDC before next PUC meeting.
- Non-Structural Performance:

- The ATC 120 study evaluated it at three levels: Frequent Earthquake, Design Earthquake,  $MCE_R$ .
  - Reliability of Nonstructural Safety? ATC 120 WG-3 is investigating 10% failure in design earthquake with 90% confidence.
  - Discussion on the resonance between the non-structural components and the building itself.
  - ATC 120 will include work on design beyond code requirements, which will become a Part 3 paper.
- Function protection:
    - Define reliability as 10% probability of loss of function in DE for RC IV
    - Identify changes in Chapter 12, 13, and 15 to meet this goal
    - Develop provisions for DE evaluation in Chapter 16 assuming Section 16.1.2 (linear analysis requirement) goes away
    - Assess appropriateness of  $2/3MCE_R$  as function hazard for RC IV
    - There is not much momentum to have such requirements for Risk Category III for lower hazard intensity or reliability.
    - Expecting PUC proposals in 3<sup>rd</sup> or 4<sup>th</sup> quarter of 2018
  - Brief discussion of ICC performance code: The return period in the tolerable damage matrix of the ICC code is unreasonable (too low). The PUC might provide comments on revised proposals, but it might be a more appropriate task for the CRSC.
  - Resilience White Paper (Attachment 8): An outline was developed and will be distributed among PUC members. May have the paper in Q3 of 2018. (Part 3 of the NEHRP Provisions).

## 10. IT2 Seismic-Force Resisting Systems and Design Coefficients-Sandy – Sandy Hohener

Future Proposals: IT2 will have a torsion proposal based on ACT 123 for Ballot 3 and proposals on Orthogonal Combination for Ballot 5.

IT2 submitted five proposals that were balloted online between October 16 and November 19, 2017. Sandy served as the proponent for the five proposals, prepared the responses to all the comments received during the ballot, and presented the responses at the meeting.

- **Proposal No. 3 - IT2-1-Rev.0-2017-10-06 Scope of Application For Increased Collector and Diaphragm Connector Forces**

Online votes: Yes, 15; Yes with Reservation: 2; No, 3. Result: Pass.

The PUC agreed that this is not a “significant” technical change proposal, and decided that this proposal should be considered by ASCE7 SSC directly.

A motion to send this to ASCE 7 SSC by John Hopper, and seconded by Dan Dolan, passed with 18 in favor, 1 opposed and 0 abstaining. Move this to ASCE 7 SSC.

- **Proposal No. 4 - IT2-2-Rev.0-2017-10-06 Horizontal Irregularity Type 2 and 3 Triggers**

Online votes: Yes, 17; Yes with Reservation: 3; No, 0. Result: Pass.

Similar to previous proposal, a motion to send this to ASCE 7 SSC made by John Hopper, and seconded by Dan Dolan, passed with 18 in favor, 1 opposed, 0 abstaining. **Move this to ASCE 7 SSC.**

- **Proposal No. 5: Proposal No.5 - IT2-3-Rev.0-2017-10-06 Eliminate Weight (Mass) Irregularity**

Online votes: Yes, 12; Yes with Reservation: 5; No, 3. Result: Pass

Carrato and Lizundia's "No" votes: Sandy's motion that the comments are Non Persuasive, with a second by Hooper, failed with 6 in favor, 7 opposes, and 4 abstaining. **Action: the proposal will go back to ATC 123 to check the range (not only moment frames, but include other systems, base overturning, story shear).**

- **Proposal No. 6 - IT2-4-Rev.0-2017-10-06  $C_d = R$  For Building Separation**

Online votes: Yes, 12; Yes with Reservation: 4; No, 4. Result: Pass

General PUC comments: make it a broader range (drift limit, cladding, etc.) instead of only story drift and structural separation, which may need extended resources, and is beyond what IT2 can do with volunteer-based efforts. Do we have enough information to make the change and is it conservative?

Pekelnicky's "NO" vote (similar to other "NO" Votes) which suggests making the proposal more comprehensive was voted as non-persuasive, with 11 in favor, 5 opposed, and 1 abstaining.

**Sandy proposed to withdraw this proposal and Proposal No.7 (below) in their current form, rework the reason statement (check with Charlie Kircher and Kelly Cobeen), and submit for re-balloting.**

A show-of-hands vote supported moving forward with No.6 and No. 7, then later on investigating the topic more broadly (independently from support No. 6 and No.7): in favor: 18, oppose 0, abstain 0. **A new group [Kelly Cobeen (lead), Sandy Hohener, Bob Pekelnicky, John Gillengerten, John Hooper] was formed to develop the scope of this broad study. This will be further discussed in next PUC meeting].**

- **Proposal No.7 - IT2-5-Rev.0-2017-10-06  $C_d = R$  For Deformation Compatibility**

Online votes: Yes, 10; Yes with Reservation: 5; No, 5. Result: Pass

See PUC actions under Proposal No. 6.

## 11. IT3 Modal Response Spectrum Analysis Considerations – Anindya Dutta (Attachment 9)

The IT is finishing an analysis on Topic 2, then will start on Topics 3, 4, and 6 of the IT scope of work.

- Topic 2: Reduction by R only in the first mode (assuming higher modes are elastic)
  - In the previous analysis (reported in previous meetings) there was no effect for regular buildings
  - For mass irregularity, there is no difference  $R=C_d$  on first mode or whole building
  - Next step: stiffness and torsional irregularity. Anindya presented the building layout for torsional irregularity with no further comment from PUC on the layout. It was suggested the IT look at coupling irregularity, mass + torsional irregularities; the first floor acceleration data; and, the possibilities of a comparison with the ATC 123 study. Annida will contact Sandy Hohener about the ATC 123 study.
- Topic 3: Consideration (or reconsideration) of the appropriateness of current approaches for scaling to the results of an equivalent lateral force analysis
- Topic 4: Application of a multi-degree-of-freedom factor
- Topic 6: Revisit triggers for Dynamic RSA in ASCE 7 and realign with efforts of ATC 123

## 12. IT4 Shear Wall Design -SK Ghosh (Attachment 10)

- Modifications to ASCE 7-16 Table 12.2-1 that include adding line items on Bearing Wall Systems, Building Frame Systems, and Dual Systems featuring Ductile Reinforced Concrete Coupled Walls will be targeted for ballot in December, 2018. Items reported are:
  - Ductile shear wall and ductile coupling beams: Specified in ACI 318, but not the ductile coupled shear wall system.
  - Ductile coupled shear wall system: Specified in Canadian standards.
  - ACI 318 definition of ductile couple shear walls: Only based on geometries under the current definition (aspect ratios length/height between 2 and 5). The IT is looking at additional threshold (total beam length/total length of the system). PUC Comments: Should make sure this is a strong wall weak beam system.
  - John Hooper provided an update on the John Wallace's P-695 study (Attachment 11). PUC Comments: It is suggested to compare with regular shear walls (coupled shear wall  $R=8$  vs regular shear wall  $R=6$ ), which have been validated in the code.
  - Ductile reinforced concrete shear walls coupled with steel beams: Research is underway at the University of Cincinnati, with a target R of 8. IT 4 will monitor the research process (self funded study, not much detail) and SK and John Hooper will follow up.

- Composite steel plate shear walls with coupling: Being tested at Purdue University and University of Buffalo, funded by AISC and Pankow Foundation. The team target to get this added to ASCE 7 Table 12.2-1 with an  $R = 8$  and it is anticipated to be July, 2018. (The definition of this system will be in AISC standards).

- A Part 3 IT4 resource paper is targeted to have the first ballot in March 2019.
- The next IT4 in-person meeting is schedule on January 23-24, 2018.

### 13. IT5 Nonstructural Components, John Gillengerten (Attachment 12)

ATC 120 will be completed in March 2018. The issue team formed four working groups to prepare proposals for the PUC (Attachment 13).

- Scoping group, led by Bill Holmes, with 3 possible proposals.
  - #1 proposal on chapters 13.1.1, 13.1.4 (may go to ASCE 7 directly), 13.1.2, 13.1 (clarify applicability of requirements found in other seismic design chapters in ASCE 7 to nonstructural components - may go to ASCE 7 directly).
  - #2 proposal on Table 13.5-1.
  - #3 proposal on Section 13.5.10.
- Nonbuilding structures/nonstructural components group, led by Greg Soules, with 2 possible proposals. (by Greg, Attachment 14)
  - Scope: Develop a method of classifying items as nonstructural components vs nonbuilding structures; revisit 25% Weight Rules of Sections 13.1.1 and 15.3; look at moving some traditional nonstructural components from Chapter 13 to Chapter 15; and develop provisions for using Chapter 15 to design supports for nonstructural components.
- Component design group, led by Meaghan Halligan, with 4 possible proposals.
  - #1 proposal on Sections 13.2 and 13.3, to develop methods for estimating nonstructural component displacements and criteria for accommodating these displacements.
  - #2 proposal on Table 13.5-1 (may go to ASCE 7 directly), C 13.5 (will stay with PUC), and 13.6 (design guidance for in-line components in distribution systems - may go to ASCE 7 directly), 13.5.6 (additional design guidance for suspended ceiling systems that are not lay-in types).
  - #3 proposal on Section 13.4 (expand the requirements for the design of nonstructural supports).
  - #4 proposal on Section 13.6, Trapeze issues and criteria for distribution systems on spring hangers - may go to ASCE 7).
- Lateral force group, led by Bret Lizundia, with 3 possible proposals.
  - #1 proposal on lateral force equations based on ATC 120 recommendations.
  - #2 proposal on developing revised design coefficients for nonstructural components.
  - #3 proposal on reviewing the omega factor for attachments in concrete and masonry and criteria for use of power-driven fasteners in seismic applications.

The issue team plans to have the first few proposals by next PUC meeting and most proposals in a period of 18 months.

#### 14. IT 6 Non-Building Structures, Pete Carrato (Attachment 15)

Future activities:

- For a distributed system that is in progress, a white paper will likely be developed.
- Large concrete machine foundations (table top machine foundations) are under consideration.
- Lattice columns are under future consideration.
- Items from Chapter 13 which will be coordinated with IT 5.

IT6 submitted two proposals that were balloted online between October 16 and November 19, 2017. Pete Carrato served as the proponent for the two proposals, prepared the responses to all the comments received during the ballot, and presented the responses at the meeting.

- **No. 2 - IT 6-1 Rev. 0-2017-02-06 Corrugated Steel Liquid Storage Tanks** (by Greg, Attachment 16)

Online votes: Yes, 11; Yes with Reservation: 5; No, 4. Result: Pass

Motion to move to ASCE 7 by John Silva, seconded by John Hooper passed, with 15 in favor, 0 opposed and 0 abstaining.

- **No.8 - IT6-2-Rev.0-2017-10-03 Fiberglass Cooling Towers**

Online votes: Yes, 13; Yes with Reservation: 3; No, 4. Result: Pass

Motion to move to ASCE 7 by Jim Harris, seconded by Kelly Cobeen passed, with 15 in favor, 0 opposed and 0 abstaining.

#### 15. IT7 Soil-Foundation Interaction - Steve Harris (Attachment 17)

- Modifications to section 12.13.9: requirements for foundations on liquefiable site:
  - (1) Possible proposal on a revised Section 12.13.9.2.1.1. It was decided that this will be considered within the ASCE 7-16 supplement 1. The change is almost editorial and will be balloted within the ASCE 7 SSC.
  - (2) Revisions to 12.13.9.3.1 Downdrag: These will be balloted by the PUC before its April meeting then submitted for ASCE 7-16 Supplement 1.
- Modifications to Chapter 12 and 19 for Soil-Structure Interaction: The IT will have the following Part 1 proposals for April 2018 PUC meeting.
  - (1) Proposal to modify section 12.13.3 to eliminate the requirement for using a 50% increase and decrease in foundation stiffness, which does not have a significant effect compared to changing from a fixed to a flexible base model. PUC Comments: There is a range of foundation stiffness that could affect structural response. Do we have the

confidence or have enough information to eliminate the 50% requirement? If eliminated, shall we require the foundation stiffness come from a geotechnical report?

(2) Proposal to modify section 19.2.3 to replace three limitations on spectral reduction to single limit.

(3) Proposal to modify section 19.4 to eliminate the additional 25% adjustment on the response spectra reduction factor for base slab averaging and embedment.

(4) Proposal to modify sections 19.2.1, 29.2.2 and 19.4 to permit KSSI in linear analysis

- Lateral Earth Pressure: The IT will have Part 3 Resource Paper for the PUC Summer 2018 meeting.

(1) The topic will be seismic earth pressures.

(2) The new resource paper will mainly be used by geotechnical engineers to produce the  $P_e$  value, which will be used by structural engineers.

- Other topics, including Rocking and Foundation Modeling, Design Forces for Foundations, Geotechnical Requirements for Strength and Stiffness, will possibly have Part 3 Resource Papers in late 2018.

#### **16. IT 9 Diaphragm Issues - RWFD and Alternate Provisions for Diaphragm Design, Kelly Cobeen (Attachment 18)**

- Scope 1: RWFD: Part 1 proposals
  - #1, RWFD with wood diaphragm: IT9 will have a written proposal to the PUC during the next PUC meeting in April 2018.
  - #2, incorporating steel deck diaphragms: Still in progress, but IT9 will possibly have a written proposal to the PUC in November 2018. Steel programs will have presentations at the PUC April 2018 meeting.
  - #3, drift due to diaphragm deflection (12.10.4 in the diaphragm, available alternate).
- Scope 2: Diaphragm Alternative Design Method, deriving  $R_s$ : It is more likely to that a Part 3 document will be developed on this topic. IT9 will continue to monitor steel research projects (SDII, Steel Diaphragm Innovation Initiative and Advancing Seismic Provisions for Steel Diaphragms in RWFD Buildings). SDII plans to have proposals for AISC but no ASCE proposals.

#### **17. General instruction for future proposals**

When new technical issues are introduced, consideration should be given to whether they should go to ASCE 7 directly and not to the PUC for balloting. For cases in which a proposal may be appropriate for ASCE 7 to handle directly, the proponent only needs to describe the issue to the PUC during a meeting or by teleconference, but not develop the proposal. Occasionally, the concept might need to be developed to the proposal stage for balloting by the PUC before it is sent to ASCE 7. Such proposals might be sent to ASCE 7 either during PUC balloting, or during the follow-up adjudication process, before they go

on to be balloted by member organizations. In general, the PUC should not prepare proposals that can be developed equally well within ASCE 7 Seismic Subcommittee.

## **18. Adjourn**

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

Future PUC meetings:

- PUC meetings: April 4-5, 2018 (4/3/2018, P17 meeting).
- PUC meetings: August 15-16, 2018 (8/14/2018, P17 meeting).