July 18, 2016
P17AC Report to Ron Hamburger, P17 Chair

P17AC Members:
- Jennifer Goupil, chair
- Adrian Rodriguez-Marek
- Gary Ehrlich
- John Egan
- Kevin Moore
- Mike Mota
- Phil Caldwell
- Zia Zafir
- Greg Soules

The P17AC has met twice since last P17 meeting. In summary of our discussions up to this point: the P17AC does not intend to be a technical peer reviewer of the P17 work, instead the AC would like to provide value by collecting opinions or providing feedback on the following Qs:

- What is the role of the maps for seismic engineer?
- What do practitioners need from the maps versus database?
- What are the political or functional ramifications for the maps/database?

At this preliminary stage in the process, the P17AC has discussed the two specific Q posed by Ron of “database method for conveying map information, and the zone with step-functions approach” and created the bullet list of items that I sent earlier.

This is not comprehensive nor is it prioritized, but rather a collection of reactions from the individuals on the committee. As the P17 work evolves and the AC becomes more familiar with the progress, the AC will discuss how to provide more feedback and/or recommendations to the P17 committee.

**BSSC Project 17 Advisory Committee Straw Man**

**Comments on the use of “Zones”**

- I like the concept of “Zones” for Seismic Design Category. Stabilization of the Seismic Design Category would be a significant benefit for practicing engineers. (J. G. (Greg) Soules)

- The idea of using zones was mentioned as a way to bring stability to design criteria. I would stress that the idea of zonation makes sense from the point of view of the seismic design criteria definition. However, zones would not be practical (and I believe they would be a step back) for defining seismic demand in terms of spectral acceleration. (Adrian Rodriguez-Marek)
• Do not use term “Zone” for optional ground motion maps, suggested is a more complex name such as “seismic area ground motion input risk map.” Making the name complex renders it difficult for the average design professional and other users to turn the code into a “one-page document.” (Phil Caldwell)
  o Prior to the 2000 IBC this was especially problematic for project coordination outside of the U.S. for locations whose national code used “zone maps” with different scales such as Chile (three zones), Russia (10 intensities that were incorrectly interpreted as zones) etc.
  o It was never clear to those outside of the earthquake engineering community that “Zones” were a dimensionless construct with an engineering meaning only within the model code associated with the map.
  o Legacy UBC “zone maps” were perceived as implying design demand by MEP design professionals and nonstructural markets. For the 1997 UBC users never understood the implications for near field, there was literally one design implication for “Zone 4” – in essence from the markets perspective “Zone 4” was “Zone 4”, it could not have two meanings.
  o In essence the seismic design provisions of the UBC were stated entirely by one page – the Seismic Zone Map of the US. To preclude this misinterpretation it is suggested that any simplified mapping solution clearly state in bold, hard to miss font, that the “… map is to be combined with other code parameters to determine the actual design demand – the map is not a stand-alone statement of design demand.”

• Do not provide design equations within the code that allow for the user to take a “seismic area ground motion input risk” designation and determine design demands. Instead if the user takes the optional path of using the “seismic area ground motion input risk map” assignment that a table must be used to translate this broad geographic construct for ground motion into the maximum values of spectral response, $S_s$ and $S_1$, that will be required for all design equations. This would encourage the design professional to back up and do a quick check to see if using a location specific design ground motion from the USGS ground motion database would result in a lower value of $S_s$ and $S_1$. (Phil Caldwell)

• As I think I stated on one of the calls, I prefer the “fat contour” approach to the “zone” approach. My primary concern would be that a “zone” system would result in higher seismic design requirements being extended to areas near the edges of the zones than would currently apply, unless you subdivide the zones (e.g. SDC D0, D1 and D2 as used in the IRC, rather than just one SDC D “zone”. As noted by others, a “zone” system targeted to political boundaries has significant issues, e.g. driving development to areas with lower requirements. (Gary Ehrlich)

Method of Conveying Map Information

• Design earthquake ground motion maps in future editions of ASCE/SEI 7, similar to those currently published in ASCE/SEI 7-10, must be made available at a minimum in
electronic form (i.e. PDF files) with appropriate distribution controls to enable them to satisfy their use as an alternate method of engineering quality assurance for the responsible design professional. Traceable and controlled versions of these maps are essential for the design professional to use as an engineering quality control check to verify design values obtained from the USGS automated online tool for software errors, incorrect entry of site coordinates etc. (Phil Caldwell and J. G. (Greg) Soules)

- Ground motions do not change with each map update without compelling reason to justify change. Changes due to “refinements in the science process” would not be incorporated into the maps. Only changes based on widely accepted significant and new knowledge of ground motions acknowledged in both the engineering and scientific community. (Phil Caldwell and J. G. (Greg) Soules)

- Expand the ground motion database of 0.2 and 1.0 sec with multi-spectral periods that go out to 10 seconds and eliminate T_L. (Phil Caldwell and J. G. (Greg) Soules)

- Look for opportunities to control the triggers from SDC B to SDC C in future codes and their associated maps. It is these ground motion triggers that have been largely to blame for the backlash from the design community in the past. Some map updates have moved the SDC trigger boundaries back and forth over vast areas of population centers of the East Coast from Florida to New England based on minor tweaks in the probabilistic science underpinning the NGA updates, not real world engineering justification. (Phil Caldwell)

- Make changes to the Seismic Design Categories less sensitive to changes in ground motion values/maps. (J. G. (Greg) Soules)

- From a building code perspective, I believe there must be a basic map of some sort either in the code or in ASCE 7. Building officials need this to have something legally enforceable. Engineers, designers and builders need this to at least have an ability to quickly check a design (see comment by Soules and Caldwell above), and it would also be sufficient for schematic design purposes. From there, the USGS web tool or a USGS database can be referenced where a higher accuracy is needed, and of course for projects where it is justified there is always site-specific analysis. (Gary Ehrlich)

- Related to the above, one interesting possibility could be for ASCE 7 and building codes to incorporate maps like the SDC map used in the IRC, instead of trying to map closely-spaced contours at a small scale and have something readable. Maps could be generated for each of the site classifications. Then you are sent to the USGS web tool or database for the actual design spectral accelerations. (Gary Ehrlich)

- I also agree with the comments from Caldwell and Soules regarding the constant up-and-down changes in ground motions based on the latest science. Perhaps a minimum threshold for implementing a change should be established. For example, a 10%
increase or decrease may not represent a significant cost savings or increase in risk, but perhaps a 20% change does. (Gary Ehrlich)

DISCUSSION:

Charlie Kircher
Design values by county (geo-political) boundaries – zones are straightforward where not a lot of changes with the boundaries, but hard when a lot of changes in one boundary

Q: Would there be a benefit to ONE value for each jurisdiction? What are benefits and challenges? Big counties in west are challenge, but also some in mid-west are a challenge, but would this be more attractive to the jurisdictions?

JG: The AC has discussed this topic, and we were curious on if P17 wanted this feedback, we could work towards collecting it. How would the AC get that feedback?

Ron Hamburger
Q: How amenable do you think the design committee and jurisdictions would be to a radical change from current format in how data is presented or what is based upon?
   - Example, going to a somewhat moderate return period and going away with deterministic event
   - Example, changing event 1% to 2%
How open would users be to radical changes if based on stable process and rational decisions?

JG: The AC could discuss how to do this and if we want to take this on.
RON: The P17 committee would want to have data summarized and filtered for usefulness of feedback. Would AC want to take this on? Not have list of 100 comments but have summary.

Jon Siu
Q: Are there any regulatory member of AC? No
Q: Would be useful to get feedback from regulatory users of maps. Could AC also go to BO orgs to collect feedback?

NEXT STEPS: Jennifer to take this request back to AC for input and commitment to execute.