6NSC Special Session

T3: Special Session on AASHTO T3 (Seismic) 2008 Ballot Item:
Liquefaction and other Guide-Specification Changes

This session was focused on the recent 2008 ballot item, which included changes and additions to both the LRFD Bridge Design Specifications and the Guide Specifications for Seismic Design. Lee Marsh and Don Anderson presented a detailed overview of significant changes in the 2008 ballot item. An open discussion followed, with question/answer(s) noted below:

Q. What method was recommended for screening liquefiable soils from nonliquefiable soils?

A. The revisions to the specifications are not prescriptive in this area. The commentary provides a discussion of the reason for not recommending a specific method. This reason is that there doesn't seem to be a current consensus on this within the profession. Two methods are identified in the commentary – the method recently published by Boulanger and Idriss and the method published by Bray and Sancio. A clear statement is made that the Chinese method should not be used. The Owner (State/Agency) can identify a specific method if it has a preference. An example is what Washington State has done in their Geotechnical Design Manual.

Q. Explain why there are differences between the AASHTO LRFD Bridge Design Specifications and the recently balloted Guide Specifications for seismic design with respect to load factors.

A. LRFD Specifications
R-factors use a linear process inherent in the force-based procedure. The force-based procedure in LRFD adopted a maximum and minimum factor for use with permanent loads similar to the approach used by ASCE 7 for buildings and other structures. This approach reduces the benefit of permanent loads when they help resist seismic loads and it increases the demand from permanent loads when they act in the same sense as seismic loads. This approach is simple and reasonable for the force-based procedure.

Guide Specifications
The GS uses load factors of 1.0 for permanent loads. Because the GS does not have a specific requirement for the strength of yielding elements, because the other elements are designed using capacity protection principles, and because adequacy checks are made using push-over analysis, the load factors have been simplified to 1.0.

Q. Explain the difference in detailing (confinement spacing) between 4 inch (LRFD Spec.) and 6 inch (Guide Spec.)

A. The Guide Spec. Improvement Team recommended 6 inch spacing (Note: Caltrans SDC uses 8 inches, as does ATC-32. Division I-A used 4 inches. ACI

318-08 permits spacing up to 6 in. with cross ties at no more than 14 in., and uses 4 inches otherwise. The associated 6db limit - also required to prevent individual bar buckling – controls the spacing for #8 bars and less when the new 6-in. blanket limit is used. Because most bridge columns will use longitudinal bars larger than #8s, the new limit appears reasonable and practical. If smaller bars are used, then the 6db limit will control, and this would be reasonable for smaller columns. LM note post-6NSC special session)

Q. There appears to be some inconsistency in determining "No analysis zone" and the Seismic Design Categories or Zones. Should the short-period spectral acceleration be used in determining SDCs or Zones?
A. Lee Marsh suggestion: Good item for parking lot.

Q. How can we get access to the USGS/AASHTO Hazard Maps?
A. The current USGS/AASHTO maps require some minor corrections before they are to become available. On the CD tool, zip codes currently don't work for all areas and there is a problem with the interpolation of the site factor for PGA. We need a status update on when they will be available and need a process and contact person within USGS for future queries and updates. A request will be made to USGS, then . . . (E.V. fixed the zip codes?? To be confirmed KJT)

Q. What factor of safety should we use for Liquefaction?
A. The revisions to the specifications and commentaries are not specific on the minimum acceptable factor of safety for liquefaction. This is left to the engineer and agency. We usually assume that liquefaction occurs for FS = 1.0; however, common practice is to require a FS = 1.1 to 1.3 to account for uncertaintainties. In hindsight, it would have been good to provide specific guidance, so this will be put on the parking lot list of things to add.