NOTICE OF UPCOMING TECHNICAL PRESENTATION

Tuesday, November 14, 2017

TOPIC: **Probability Approach for Ground and Structure Response to GSC 2015 Seismic Hazard including Crustal and Subduction Earthquake Sources**

SPEAKER: **Guoxi Wu, Ph.D. P.Eng., Specialist Engineer, BC Hydro**

Dr. Wu is a registered geotechnical engineer with Master's (1992) and Doctorate degree (1994) from the Civil Engineering Department of the University of British Columbia where he contributed to the seismic induced liquefaction-deformation and remediation study of the Sardis Dam in Mississippi and researched dynamic soil-structure interaction of pile foundations and retaining structures. He has since made over 50 publications in geotechnical earthquake engineering including a recent article of "Seismic Design of Dams" on the Encyclopedia of Earthquake Engineering. Prior to joining BC Hydro Engineering in 2007, his consulting experience included works with AGRA Earth and Environmental in Burnaby (now AMEC Foster Wheeler), Klohn-Crippen Consultants Ltd. in Richmond (now Klohn Crippen Berger), EBA Engineering in Vancouver (now Tetra Tech EBA), and Golder Associates Ltd. in Burnaby.

CONTENT: The fourth generation seismic hazard maps of Canada developed by Geological Survey of Canada (GSC) included hazard values for a probability of 2%/50 years that were adopted in the seismic provisions in the 2005 and 2010 National Building Code of Canada (NBCC). However, these hazard values were derived from only the crustal earthquake sources (magnitude in the order of 7), while seismic hazards from the Cascadia subduction earthquake source (magnitude in the order of 9) were evaluated separately using a deterministic approach for hazard assessment based on the distances to the site. The hybrid method mixing probabilistic and deterministic approaches makes it impossible to design a certain structure to withstand seismic risk at a given overall probability level including all earthquake sources.

The 2015 GSC fifth generation seismic hazard model addressed the above issue by providing seismic hazard maps (e.g., 2%/50 years) with seismic hazards from all earthquake sources including the contribution from the Cascadia subduction earthquake. However, the total Uniform Seismic Hazard (USH) Spectra possesses challenges to civil engineers in how to apply the USH spectra in engineering design as the two earthquake sources have dramatically different magnitudes (M7 for crustal and M9 for subduction interface) and thus they would result in ground and structural response (such as ground displacement, soil liquefaction potential, or bending moment in building columns) in an order of magnitude difference. Using the same USH spectra for crustal and subduction sources will simply not work for engineering performance assessment or in design of new buildings.

This presentation will provide an overview on how to make use of crustal, in-slab, and interface subduction hazard values from the 2015 GSC Model for the 13148 grid points (10 km by 10 km) in southwestern Canada (southern BC and western Alberta). USH spectra for crustal/in-slab earthquakes and USH spectra for Cascadia subduction interface earthquake can be derived at a couple of probability levels. Structure performance assessment can then be determined separately for the two main earthquake sources at a couple of probability levels. The overall probability at a given performance level (displacement, liquefaction or others) can then be determined by adding the probabilities from each of the two individual performance hazard curves. The overall performance (displacement, liquefaction or others) at a target probability level (e.g., 2%/50 years) is then determined from the overall combined performance hazard curve. Examples for determining seismic slope displacements from empirical equations (Bray and Travasarou 2007, Macedo et al. 2017) and for assessing site response and liquefaction using nonlinear finite element time history analyses (VERSAT, Wutec 2016) will be shown to illustrate the proposed procedure.

DETAILS:

Location: Executive Inn, 4201 Lougheed Highway, Burnaby, BC V5C 3Y6
Social Hour: 5:30 to 6:30 pm (drinks available at the hotel bar)
Technical Presentation: 6:30 to 7:30 pm (No need to RSVP)
Dinner: 8:00 pm ($20 will be charged for dinner). If you would like to stay for dinner, please RSVP to Tim Morton via email (timothy.morton@ghd.com) or at the door.