

The Canadian  
Geotechnical Society



La Société Canadienne  
de Géotechnique

## CGS Fall 2016 Cross Canada Lecture Tour Dinner Presentation

### Liquefaction effects on piled bridge abutments: Centrifuge tests and numerical analyses

**Presented by:**

**Ross W. Boulanger, Ph.D., P.E., F.ASCE**

Professor and Director, Center for Geotechnical Modeling  
University of California at Davis

#### **Presentation Abstract:**

Earthquake-induced deformations of piled bridge abutments in approach embankments underlain by liquefied soils may be reduced relative to free-field deformation values by the restraining forces from the piles and bridge superstructure. Three dynamic centrifuge model tests demonstrating pile pinning effects in approach embankments were numerically simulated using two-dimensional finite difference models. Each centrifuge model was composed of two identical embankments underlain by liquefiable soil, one with a pile group and the other without. Two-dimensional nonlinear dynamic analyses of the centrifuge model were performed using the finite difference program FLAC (Itasca 2011) with the user-defined constitutive model PM4Sand (Boulanger and Ziotopoulou 2015).

Agreement between the numerical simulations and centrifuge model results are assessed through comparison of accelerations, pore water pressures, displacements, and pile bending moments for both the piled and non-piled embankments. The capabilities and limitations in the numerical modeling procedures for the seismic evaluation of piled and non-piled bridge approach abutments are discussed and recommendations regarding the use of nonlinear deformation analyses in practice are presented.

**Date:** Tuesday, October 25, 2016  
**Time:** Doors open at 5:00 PM, Dinner at 6:00 PM,  
Presentation at 6:30 PM  
**Location:** Holiday Inn South, 1330 Pembina Highway  
**RSVP:** 12:00 PM, Wednesday, October 19, 2016

#### **About the Presenter:**

Professor Ross W. Boulanger is the Director of the Center for Geotechnical Modeling in the Department of Civil and Environmental Engineering at the University of California, Davis. He received his Ph.D. and M.S. degrees in Civil Engineering from the University of California at Berkeley, and his B.A.Sc. degree in Civil Engineering from the University of British Columbia. His research and professional practice are primarily related to liquefaction and its remediation, seismic soil-pile-structure interaction, and seismic performance of dams and levees. Over the past 25 years, he has produced over 250 publications and served as a technical specialist on over 50 seismic remediation and dam safety projects. His prior honors include the TK Hsieh Award from the Institution of Civil Engineers, and the Ralph B. Peck Award, Norman Medal, Walter L. Huber Civil Engineering Research Prize, and Arthur Casagrande Professional Development Award from the American Society of Civil Engineers (ASCE).

#### **To attend, please supply names to:**

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#### **Cost (cash or cheque):**

**Members:** \$ 25  
**Non Members:** \$ 30  
**Students:** \$ 20

- This event qualifies for 1 Professional Development Hour. The event is classified as 'Informal Activity' under EGM's CPD Program.
- Please note that if you are unable to attend, someone else can be sent in your place. No shows will be invoiced. Cancellations should be made no later than 24 hours prior to the event.