Vancouver Geotechnical Society

A Local Section of the Canadian Geotechnical Society

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NOTICE OF UPCOMING TECHNICAL PRESENTATION

Thursday, 22 April 2021

TOPIC: **Design of pile-supported wharves subjected to inertial loads and liquefaction-induced lateral ground deformations**

SPEAKER: **Arash Khosravifar, Ph.D., P.E.– Assistant Professor, Portland State University**

Arash Khosravifar is an assistant professor in Civil and Environmental Engineering Department at Portland State University (PSU). He joined PSU in December 2015. Prior to joining PSU, he worked for Fugro Consultants Inc. in California where he worked on seismic hazard studies for highway transportation projects (bridges) and offshore and nearshore energy developments (oil and gas, wind turbines). He obtained his Ph.D. from University of California, Davis where he conducted research on analysis and design of piles in liquefied soils.

CONTENT: Five dynamic, large-scale centrifuge tests on pile-supported wharves were used to investigate the time- and depth-dependent nature of kinematic and inertial demands on the deep foundations during earthquake loading. The wharf structures in the physical experiments were subjected to a suite of recorded ground motions and imposed superstructure inertial demands on the piles. Partial to full liquefaction in loose sand resulted in slope deformations of varying magnitudes that imposed kinematic demands on the piles. It was found that the wharf inertia and soil displacements were always in-phase during the critical cycle when bending moments were at their maximum values. The test results were analyzed to provide the relative contributions of peak inertial loads and peak soil displacements during critical cycles, and the data revealed the depth-dependency of these factors. The centrifuge tests data were also used to develop an equivalent static analysis (ESA) procedure to combine inertial and kinematic loads during earthquakes. The accuracy of the ESA procedure is evaluated against measurements from the centrifuge tests. It is shown that large bending moments at depths greater than 10 pile diameters are primarily induced by kinematic demands and can be estimated by applying soil displacements only (i.e., 100% kinematic). In contrast, the large bending moments at the pile head are primarily induced by wharf deck inertia and can be estimated by applying superstructure inertial loads at the pile head only (i.e., 100% inertial). The large bending moments at depths shallower than 10 pile diameters are affected by both inertial and kinematic loads; therefore, the evaluation of pile performance should include soil displacements and a portion of the peak inertial load at the pile head that coincides with the peak kinematic loads. Proposed ranges for inertial and kinematic load combinations in uncoupled analyses are provided.

DETAILS: **Technical Presentation: 5:30 pm – 6:30 pm**

Link: https://attendee.gotowebinar.com/register/1161000030918951694