6th Annual Web Conferences 2020
Technical Committees

Live Streaming Daily – Technical Case Studies

December 6 – 10, 2021

The Geo-Institute Computational Geotechnics Technical Committee will live-stream the session "*Computational Geotechnics and Insights into Soil Behavior*" on Tuesday, December 7 at 11 AM EST. The topics include:

"Insight on Classic Soil Mechanical Behaviors from Holistic Computational Simulations", **Xiong (Bill) Yu,** Ph.D., P.E., F.ASCE

Soil mechanics are founded based on classic experiments that describe macroscopic properties. This presentation will describe our research in understanding the fundamental mechanisms of soil particle interactions and its influence on the bulk soil behaviors. A holistic simulation model is developed that is infused with parameters obtained from microscopic measurements of interparticle interactions. With the interparticle mode, the overall soil mechanical behaviors are simulated. The predicted soil compression behaviors resemble the experimental observations. Sensitivity analyses further elucidates the mechanism of soil memory, i.e., energy valley due to interparticle forces, and soil fabric. The developed framework is promising to offer new directions in a combined simulation and experimental approach that advance the heuristic nature of classic soil mechanics.

"Modeling Secondary Compression", **Martin Hawkes,** P.E., M.ASCE

Secondary Compression, creep, visco-elasticity are often a source of problems in soft soil but are seldom understood. The process is defined as stress independent deformation, ongoing deformations at constant stress. The rate of creep is both stress dependent and time dependent. Defining secondary creep parameters in terms of change in void ratio (or strain) per log of time leads to much confusion about what is the appropriate time scale, especially when creep rate is altered from a change in construction activity. This presentation discusses lessons learned from using the Plaxis Soft Soil Creep model on several project where reduction of the creep rate is the primary goal of the construction.

SPH-DEM Evaluation of Flow Failure", **Saman Farzi Sizkow**

A coupled SPH-DEM scheme is employed to study flow failure of a liquefiable sand layer overlain by an impermeable crust. In this technique, DEM is used to model soil particles and the fluid is simulated using SPH. The coupling between the phases is achieved through well-known semi-empirical relations. The proposed approach is used to analyze the seismic response of a mildly sloping deposit with an impermeable crust. Flow failure was observed during the seismic excitation of the model, marked by void redistribution and significant dilation of a thin layer at the liquefied layer surface as well as progressive accumulation of large shear strains even after the end of loading.

Earthquake Drain Mitigation of Seismic Damage: Research and Practical Applications", **Antonios Vytiniotis,** Ph.D., P.E., A.M.ASCE

Soil liquefaction is an important design consideration. A technique finding increasing use due to its simplicity and low cost is mitigating liquefaction using earthquake drains (EQ-Drains). EQ-Drains are perforated vertical plastic conduits that function by accelerating the dissipation of excess pore water pressures. This seminar will describe general characteristics of EQ-Drains and present the results of state-of-the art research for the design and use of EQ-Drains. The presentation will discuss coupled pore pressure-deformation dynamic finite element analyses of liquefiable soils improved with EQ-Drains. It will discuss coupling of the soil domain with simpler structural models incorporating advanced dynamic p-y springs. It will finally discuss the use of fragility analysis to understand the seismic risk of geostructural components. The seminar will include detailed comparisons with centrifuge and field experimental testing as well as practical applications for practitioners. EQ-Drains, if designed and installed correctly, can provide a cost-effective means to combine the benefits of both strength- and drainage-based liquefaction mitigation.