



CEE 595 – Geotechnical Engineering Seminar

Friday, December 8, 2017
11:00AM, Newmark Lab 3310

Dynamic response of sands under multi-directional loading: experimental investigation and numerical modeling

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Abstract

The devastating effects of the 2011 Fukushima nuclear power plant (NPP) accident in Japan prompted global interest in the seismic safety of existing NPPs. During this process, the U.S. Nuclear Regulatory Commission (NRC) identified a potential gap in the seismic deformation analysis of NPPs. Specifically, present design procedures do not consider seismic settlements in dense coarse-grained soils, which constitutes the foundation of a number of NPPs. At these sites, liquefaction is not a concern; however, multi-directional earthquake shaking can result in nontrivial total and differential settlements of structure foundations. Currently available semi-empirical settlement models are not well-constrained for dense sands and do not account properly for multidirectional loading. In addition, existing constitutive models are either numerically inefficient or restricted to plane-strain conditions; thus, not suitable for three-dimensional soil-structure interaction analysis under multi-directional shaking. To address these limitations, the authors developed new laboratory testing equipment, conducted state-of-the-art dynamic centrifuge tests, and developed a new soil constitutive model. This seminar presents the new Illinois multi-directional direct simple shear (I-mcDSS) device, describes the dynamic centrifuge testing program, and illustrates the use of the new nonlinear constitutive model (I-soil).