THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

土木及環境工程學系
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMINAR

CHALLENGES IN UNSATURATED SOIL RESEARCH AND POSSIBLE SOLUTIONS

Speaker

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Abstract

Remarkably, after nearly six decades of study of unsaturated soil behavior, arguments still exist among researchers over some fundamental aspects of unsaturated soil behavior. Most points of debate arise from poor quality data associated with laboratory measurement difficulties for unsaturated soils. Because of these measurement difficulties, drained suction-controlled triaxial (SCTX) tests, which are the simplest to perform yet require lengthy test time, have become the standard in development of a database for unsaturated soil constitutive model development. All modern unsaturated soils constitutive models have been developed using SCTX test results. Our recent studies (Zhang 2016) indicated that data from the SCTX testing methods are inadequate and inappropriate for use in the development of theories for unsaturated soils, and there is no theoretically correct data that can be used for constitutive model development of unsaturated soils.

This presentation discusses the limitations of the SCTX tests in the characterization of unsaturated soils. A possible solution to the problem was proposed based on a newly developed modified state surface approach (MSSA). It is proposed that results from undrained (constant water content) tests be used to replace the SCTX tests for the constitutive modeling purpose. Not only can it produce theoretically more correct results with much simpler testing equipment, but also significantly reduce the testing time (from 2-3 months/test to 4-5 hours/test). This can potentially lead to extensive applications of unsaturated soil mechanics in routine engineering projects.

Biography

Dr. Xiong Zhang is the James A. Heidman Professor in the Department of Civil, Architectural, and Environmental Engineering at the Missouri University of Science and Technology (Missouri S&T). He received his Ph.D. degree in Civil Engineering from Texas A&M University. Before he joined in the Missouri S&T, he worked at the University of Alaska Fairbanks and University of Cincinnati for 10 years. Dr. Zhang has been teaching and conducting research in the field of geotechnical engineering since 1992. His studies focus on development of advanced laboratory techniques to rapidly characterize geomaterials, constitutive modeling coupled hydro-mechanical behavior of unsaturated soils, numerical modeling of climate-soil-structure interaction, slope stability analysis, soil stabilization and ground improvement, and frozen ground engineering.

Dr. Zhang is currently the Chair of ASCE GI Shallow Foundation Committee, an editorial board member of Canadian Geotechnical Journal, Associate Editor for ASCE Journal of Cold Region Engineering. He is also a committee member of several nationwide technical committees such as ASCE GI Committee on Design of Residential Structures on Expansive Soil Standards, ASCE GI Pavement Committee, and TRB AKG30 Committee on Geo-Environmental and Climatic Impacts on Geomaterials. He received the 2016 International Innovation Award in Unsaturated Soil Mechanics from TC106 Committee on Unsaturated Soils within the International Society for Soil Mechanics and Geotechnical Engineering.

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