Department of Civil and Environmental Engineering

Topic: Evaluation of Stress History and Geostatic Stress State Using Directional Shear Waves

Speaker: Dr. Taeseo Ku
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Organizer: Department of Civil & Environmental Engineering

Target Audience: All are welcome. Admission is free.

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Time: 10.30 am – 12.30 pm

Venue: Seminar Room No. EA-06-02
Faculty of Engineering, NUS

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Abstract

Evaluations of stress history and the geostatic state of stress of soils are ascertained on the basis of field geophysical measurements that provide paired complementary types of shear waves. It is well-established that multiple types of shear waves occur in the ground due to their directional and polarization properties. The shear wave velocity ($V_s$) provides the magnitude of small strain stiffness ($G_0$) which depends on effective stress, void ratio, stress history, and other factors (cementation, age, saturation). This research has examined a hierarchy of shear wave modes with different directions of propagation and particle motion from in-situ geophysical tests (HH, VH, and HV) and laboratory bender element data. A special compiled database from well-documented worldwide sites is assembled where full profiles of stress state, stress history, and several paired modes of $V_s$ profiles have been obtained from crosshole tests (CHT), downhole tests (DHT), and rotary crosshole (RCHT). Reference profiles of the lateral stress coefficient ($K_0$) are available from direct in-situ measurements (self-boring pressuremeter, hydrofracture, and push-in spade cells). Stress history is documented in terms of yield stress ratio (YSR) from consolidation testing and careful engineering geology studies. Eventually, a methodology is developed that relates both the YSR and $K_0$ to stiffness ratios obtained from directional shear wave velocities. In further efforts, means to extract reliable shear wave profiles from continuous downhole testing via a new GT autosource and seismic piezocone testing are outlined and applied to results from three test sites in Windsor/VA, Norfolk/VA, and Richmond/BC.

About the Speaker

Dr. Ku is currently a senior researcher at Korea Railroad Research Institute (KRRI). Previously, he was a postdoctoral researcher at the School of Civil and Environmental Engineering, Georgia Institute of Technology where he received his PhD degree last fall 2012. He has focused on the related areas of in-situ geotechnics and geophysical site investigations. Particularly, his doctoral research concerned the evaluation of geostatic stress state by use of directional shear wave velocities, with specific application towards geocaracterization at a DOE site in Aiken, South Carolina. He earned a M.S. in GeoEngineering from University of California-Berkeley and his B.S. from Yonsei University in South Korea.