



## DEPARTMENT OF CIVIL ENGINEERING

## SEMINAR

**From Soil Liquefaction to Sustainable Geotechnics:  
Experimental Advances for Resilient Infrastructure**

Professor Welson Kwan

Department of Civil Engineering at California State University

Date: July 27, 2026 (Monday)

Time: 10:30 a.m. – 11:30 a.m.

Venue: Room 612B, 6/F Haking Wong Building, The University of Hong Kong

**Abstract**

Geotechnical engineers face growing challenges associated with seismic hazards, climate change, urbanization, and emerging environmental contaminants. Addressing these challenges requires a deeper understanding of soil behavior under complex loading and environmental conditions. This presentation summarizes recent experimental research conducted at California State University, Los Angeles, aimed at advancing both earthquake resilience and sustainability in geotechnical engineering. The first part of the presentation focuses on laboratory investigations of soil liquefaction and post-liquefaction behavior using advanced cyclic and bi-directional simple shear testing systems. Results demonstrate how loading direction, stress path complexity, particle characteristics, and drainage conditions influence liquefaction resistance and post-earthquake performance. These findings provide new insights for improving the evaluation and design of infrastructure in seismic regions. The second part highlights emerging research on sustainable geotechnics, including the effects of microplastic contamination on soil behavior, the characterization of recycled and industrial byproduct materials, and the integration of geophysical techniques for non-destructive soil assessment. Experimental observations reveal important interactions between environmental contaminants and geomechanical properties, with implications for long-term infrastructure performance and environmental stewardship. The presentation concludes by discussing opportunities for integrating advanced laboratory testing and sustainable engineering practices to enhance infrastructure resilience. The work illustrates how experimental geotechnics can contribute to safer, more sustainable, and more adaptable civil infrastructure systems in both earthquake-prone and rapidly urbanizing regions.

**About the Speaker**

Welson Kwan (關永信), Ph.D., P.E., is Professor and Interim Chair of the Department of Civil Engineering at California State University, Los Angeles (Cal State LA). He received his Ph.D. in Geotechnical Engineering from The University of Texas at Austin and both his M.S. and B.S. degrees in Civil Engineering from the University of California, Berkeley. Following the completion of his doctorate, he served as a Postdoctoral Fellow at the Norwegian Geotechnical Institute (NGI) in Oslo, Norway. Prior to joining academia, he worked as a geotechnical engineer with Jacobs Associates (now Delve Underground) and Treadwell & Rollo, Inc. (now part of Langan), contributing to major tunneling, underground infrastructure, and geotechnical projects throughout the United States. Dr. Kwan's research focuses on geotechnical earthquake engineering, soil liquefaction, advanced laboratory testing, geophysical characterization of soils, and sustainable geotechnical materials. He is recognized for his contributions to cyclic and bi-directional simple shear testing, particularly in advancing the understanding of soil behavior under complex earthquake loading conditions and post-liquefaction response. His recent research has expanded to include the effects of microplastic contamination on soil behavior, sustainable reuse of industrial byproducts, and the development of innovative laboratory and geophysical techniques for resilient infrastructure systems. As Principal Investigator or Co-Principal Investigator, Dr. Kwan has secured more than \$5.8 million in sponsored research funding, including support from the U.S. National Science Foundation (NSF) for earthquake-resilient infrastructure and advanced laboratory research. He leads Cal State LA's geotechnical engineering research program and has mentored many graduate and undergraduate researchers. A registered Professional Engineer in California, Dr. Kwan also serves as Faculty Advisor to the Cal State LA Student Chapter of the American Society of Civil Engineers (ASCE). Under his mentorship, the chapter has received multiple regional and national accolades, and he was recently honored with the 2026 Outstanding Faculty Advisor Award from the ASCE Metropolitan Los Angeles Branch.