Tufts CEE Seminar Series Presents

ROBERT KAYEN
Professor, University of California, Berkeley, (Adjunct Faculty)
Senior Scientist, U.S. Geological Survey, Menlo Park, California

Topic: Shear Wave-Velocity of Liquefied Soil: An Update

Friday March 19, 2021 – 12:00pm – Virtual event

Robert Kayen teaches Engineering Geology, extreme-event hazard-and-risk methods, and Engineering Geomatics at the Dept. of Civil and Environmental Engineering, U.C. Berkeley, and for nearly three decades has been a research scientist at the United States Geological Survey, Menlo Park, CA. Always sitting on the fence, he has a Ph.D. from U.C. Berkeley in Civil Engineering, Masters degrees in Civil Engineering & Earth Science, and most importantly is a Jumbo civil engineer (Tufts E'81) with a geology-minor. He is one of the founders and a long-time steering committee member of the National Science Foundation (NSF)-sponsored GEER - Geotechnical Extreme Events Reconnaissance Association (www.geerassociation.org) and has received honors that include the Thomas Middlebrooks Award from ASCE. Since 1989, he has led and participated in over thirty earthquake or extreme-event missions for National Science Foundation and the USGS.

The shear-wave velocity (Vs) offers a means to determine soil's seismic resistance to liquefaction by a fundamental soil property. This talk will present the results of a decades-long international project to gather Vs site data and develop probabilistic correlations for seismic soil liquefaction triggering using shear wave velocity. The first correlation, published in 2013, analyzed 121 sites from the literature and 310 test sites we investigated in China, Japan, Taiwan, Greece, and the United States.

We are currently updating the initial correlation and have expanded the data set to approximately 650 sites, mainly through new testing of the M9.0 2011 Tohoku Earthquake, Japan, and the 2011 Christchurch and 2010 Darfield Earthquakes, New Zealand. Of critical importance, these new case histories occupy locations previously investigated by penetration testing. Bayesian regression and structural reliability methods facilitate a probabilistic treatment of the Vs catalog for performance-based engineering applications. Analysis of the uncertainties of the variables comprising both the seismic demand and the soil capacity is integral to the study and allows for the reduction of overall model error.