College of ENGINEERING
UNIVERSITY OF HAWAI'I AT MĀNOA

CEE691 Seminars in Civil and Environmental Engineering

Erodibility of Cohesive Soils in Hawai'i

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Speaker: Reza Rahimnejad is a PhD candidate in the Department of Civil and Environnemental Engineering at the University of Hawaii at Manoa. He joined UHM in 2011. His dissertation focuses on estimation of scour depth around bridge piers in cohesive soils. He is an expert in geotechnical engineering, experimental design and data analysis. Prior to pursuing his doctoral degree, he worked as a structural engineer for about 4 years. Reza's primary research interests include soil erodibility, soil-structure interaction and soil dynamics.

Abstract

Almost 60% of bridge failures in the US are due to scour. The Hawaii Department of Transportation (HDOT) is interested in the integrity of bridges and their foundations during heavy floods. It is known that many of the older existing bridges in Hawaii were not designed for scour. Therefore, it is critical to have an accurate assessment of the scour depth around bridge piers. In addition, it is also critical to obtain accurate scour predictions when designing new bridges. An underestimation of the scour depth could lead to potential risk of bridge failure, while an overestimation can increase the cost of new bridges.

In Hawaii, scour calculations are traditionally performed based on the Richardson and Davis equation (1995) where the only required soil parameter is the mean particle size, D_{50}. This equation for cohesive soils typically overestimates scour depth since the scour depth is inversely proportional to D_{50}, and cohesive soils have very small particle sizes. Inter-particle electrical forces exist in cohesive soils, which cause cohesive soils to erode slower than granular soils. The SRICOS (Scour Rate In COhesive Soils) method accounts for the time-dependent nature of scour in silts and clays. It requires erodibility testing on soil samples using an Erosion Function Apparatus (EFA) and will generally result in smaller scour depths that can lead to savings in bridge construction.

The main objectives of this research are 1) to propose a method to define the critical shear stress and evaluate factors affecting its magnitude, 2) to develop a model to predict an EFA curve for cohesive soils in Hawaii based on some common soil parameters, and 3) to compare performance of SRICOS-EFA and HEC-18 methods in predicting scour depth around bridge piers with cohesive soils.