



Calibration of UBC3D-PLM Constitutive Model to Simulate the Dynamic Response of Earthen Embankment Resting on Liquefiable Soil

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Abstract

The objective of the current work is to create a numerical model to assess the dynamic behaviour of earthen embankments built on liquefiable soil. The PLAXIS 2D program, which is based on the finite element approach, was used to create the model. The foundation soil, which is the primary focus of this study, has been modelled using UBC3D-PLM constitutive model while the earth embankment material has been simulated considering the Mohr Coulomb constitutive model. To calibrate the crucial model parameters, a series of calibration studies have been conducted. The well calibrated model parameters are later has been implemented for simulating a well-documented centrifuge study. The difference in experimental and numerical model has been highlighted. Study reveals that excess pore water pressure near the embankment toe is the main concern of instability of earthen embankment which results in excessive embankment crest settlement. However, soil below embankment crest never reaches initial liquefaction condition and undergoes dilation, which shows the capability of the UBC3D-PLM constitutive model in capturing the shear induced dilation behaviour. A well comparative study of experimental and numerical analysis can provide us deeper insights on this aspect and which can also highlight key features in order to provide counter-mechanism against liquefaction induced settlement of earthen embankment. Study showed a good agreement in evaluating the effect of liquefaction on the response of earthen embankment.

Keywords: Earthen embankment, Embankment crest settlement, Excess pore water pressure, Numerical modeling