Abstract

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Finite Element Analysis of Reinforced Soil Retaining Walls Subjected to Seismic Loading

Seismic response analysis of a typical geogrid reinforced soil retaining wall constructed with and without facing units is performed. The walls are designed using Pseudo-Static design method. Employed here is finite analysis method with Drucker-Prager model to characterize the constitutive behavior of sand and nonlinear elastic reinforcement material. The interface shear between geogrid and soil is simulated using the contact pair option in ABAQUS code. Presented in this paper are the responses of the wall subjected to a typical seismic spectrum. Of particular interest in this study are: (1) the acceleration response along the height of the wall, (2) the wall displacement, (3) the tensile stress developed in the reinforcement, and (4) the relative displacement between soil and reinforcement. The probable failure modes are also sought in this study. Specifically, three possible failure mechanisms are investigated namely, wall displacement, tensile stress in reinforcement, and relative displacement between soil and reinforcement. Having designed using a factor of safety of two, the walls withstood a base excitation of peak acceleration of 0.25g. While imposing surcharge loads of different magnitudes, however, those responses begin to accumulate over the duration of the simulated seismic event, indicating imminent failure in one mode another. Slippage at the interface seems to be the probable failure mode of the wall without facing whereas the wall with facing would fail by breakage of the reinforcement. In addition, facing units inhibit the lateral deformation of the wall.