



Three-dimensional Slope Stability Under Bidirectional Pseudo-static Seismic Load

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Abstract

In general, two-dimensional slope stability methods assume the slope material as homogeneous, isotropic, and horizontally distributed, which is rarely true in reality. When the slope has complex geometry (sharp ridges, corners, cut and fill slopes, unplanned excavations, etc.), heterogeneous distribution of materials (along with depth and in out of plane direction), and complex loading conditions (seepage and seismic loading), a three-dimensional analysis for slope stability is preferred. In this article, a numerical study was conducted to assess the stability of the 3D slope under bi-directional seismic loads using the simplified pseudo-static method. The strength reduction technique is employed in a finite element framework to obtain the failure surface and factor of safety (FoS). A parametric study was performed considering four generic slopes having different complex three-dimensional geometries with similar cross-sections, soil properties, and boundary conditions to understand the variation in failure surface and FoS. The FoS obtained from the present study is plotted against the horizontal seismic coefficient applied in both lateral directions. As evident, the FoS is found to be decreasing rapidly with increasing horizontal seismic coefficients.

Keywords: 3D slope stability, Strength reduction method, Bi-directional seismic load