

Pseudo-static seismic analysis of retaining walls with circular failure wedge in frictional-cohesive backfill through horizontal slices method

Mojtaba Ahmadabadi*, Amir Pazhand, Zahra Kazemi, Lila Sokot, Ali Ghasemi

1. Lecturer and faculty member at Shiraz Art Institute of Higher Education, Shiraz, Iran, ahmadabadi.m@gmail.com
2. Shiraz Art Institute of Higher Education, Shiraz, Iran
3. Shiraz Art Institute of Higher Education, Shiraz, Iran
4. Shiraz Art Institute of Higher Education, Shiraz, Iran
5. Shiraz Art Institute of Higher Education, Shiraz, Iran

Abstract

In this study, a new formulation is provided to calculate the retaining walls seismic active earth pressure coefficient using horizontal slices method. In this study, the failure wedge is assumed circular and in frictional-cohesive backfill. In addition to the formulation, some graphs are provided to determine the pseudo-static seismic pressure coefficient without the need for the formulation of the values listed. Comparison of the proposed method with the results of previous methods shows that the calculated active pressure with circular failure wedge has larger amounts than the planar failure wedge which defines the necessity of using circular failure wedge. The proposed approach enjoys the advantage of considering the seismic shear force between the slices, cohesion and the seismic force, while in previous methods, these values were often ignored. In addition, in the proposed method, pressure distribution in the height of the wall can be plotted, and the resultant forces can be determined according to its place.

Keywords: retaining wall, horizontal slices method, pseudo-static analysis, seismic pressure coefficients, circular failure wedge

1. Introduction

Soil active pressure is calculated in different ways such as infinite method [1], theories of plasticity [2], theories of elasticity and experimental methods. Among these methods, limit equilibrium method, which is a subset of plasticity theory, has been mostly attracted researchers. Limit equilibrium method examines several mechanisms of failure surface, and obtains the minimum factor of safety using the equilibrium of forces and moments for slip wedge. This approach has been applied by Leshchinsky et al. [3] using vertical pieces method and has been extended by adding the loads of earthquake to the seismic analysis