Analytical Postprint of Pore Water Pressure Coefficients Based on the Modified Cam-clay Model

Authors: Shi Jingkang, Guan Zhenchang

Date: 2025-07-21T00:00:00+00:00

Abstract

The rational determination of soil pore water pressure coefficients under external stress is fundamental to soil mechanics, as it governs soil strength and deformation behavior. The soil pore water pressure coefficient A characterizes the pore pressure increment induced by deviatoric stress. Building upon previous pore water pressure theories, an analytical solution for the undrained pore water pressure coefficient was derived within the framework of the modified Cam-clay model and elastoplastic mechanics, with its validity verified through element-scale numerical simulations using FLAC3D software. Employing the derived analytical solution for the pore water pressure coefficient, the effects of material parameters M, λ, , and p0 , along with soil stress history and stress path, on the pore water pressure coefficient A were investigated.

Full Text

Preamble

Title: Analytical Solution of Pore Water Pressure Coefficients Based on Modified Cam-Clay Model

Authors: SHI Jingkang[1], GUAN Zhengchang[1]
[1] College of Civil Engineering, Fuzhou University, Fuzhou 350116, China

Abstract: Accurate determination of pore water pressure coefficients under external loading is fundamental to understanding soil strength and deformation behavior in soil mechanics. The pore water pressure coefficient A quantifies the incremental pore pressure generated by deviatoric stress. This study derives an analytical solution for pore water pressure coefficients during undrained conditions within the framework of elastoplasticity based on the modified Cam-Clay

model. The validity of the analytical solution is confirmed through element-level numerical simulations using FLAC3D software. Subsequently, the derived solution is employed to investigate the influence of material parameters (M, λ, , and p0), stress history, and stress path on the pore water pressure coefficient A.

Keywords: Pore water pressure coefficients; Modified Cam-Clay model; Analytical solution; Stress path; Stress history

Note: Figure translations are in progress. See original paper for figures.