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Investigation of the Effect of Crack Position and Strength Characteristics of Materials on the Stability of Homogeneous Soil Slopes

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The complexity of the conditions and behavior of soil materials, the existence of various hypotheses in the formulation of stability analysis, and the mechanism of slip and failure of slopes are among the main factors influencing the methods of soil slope stabilization. The cracks are a common occurrence on earth slopes that require a method that includes the presence of cracks in the stability assessment based on the kinematic approach of finite element and finite-difference. While many cracks may be present on a slope, the failure mechanism typically involves a crack whose position has the greatest negative effect on stability. In the present study, the geometry of critical failure surfaces, including the most undesirable cracks for slopes with different transverse and slope constraints, has been analyzed. Based on the findings of numerical modeling, it can be concluded that the critical height of the slope decreases due to the presence of cracks. This decrease, however, decreases with the angle of slope inclination. The results showed that according to the finite difference method, the most critical crack position for homogeneous soil slopes will be at the slope toe because, in this range, crack formation creates the lowest factor of safety.

Keywords: Stability Analysis, Earth Slope, Crack, Finite Difference.

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