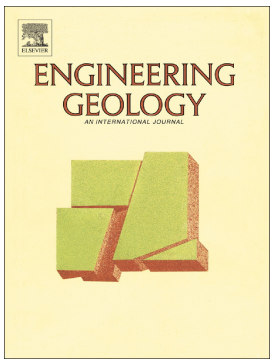

The effects of blast damage zone thickness on rock slope stability

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The Effects of Blast Damage Zone Thickness on Rock Slope Stability

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Abstract: The selection of the blast damage zone thickness T for the Hoek-Brown (HB) criterion is significant in open pit slope design and stability analysis. Traditional slope stability analysis adopts a single value of blast damage factor D for the entire rock mass, leading to the underestimation of slope stability. In this research, the parallel layer model (PLM), in which the rock mass is divided into a number of layers parallel to the slope face with a decreasing value of D applied to each layer, is used with the limit equilibrium method to investigate the effects of T on the stability of rock slopes. Based on extensive parametric studies, a blast damage zone thickness weighting factor f_T is proposed to quantify the influence of T on the evaluation of the factor of safety (FOS) of given slopes. Results show that the selection of T in the slope model plays an important role in the calculation of FOS, especially, when the ratio of T to slope height H is less than 1.0. Based on f_T and existing stability charts, a stability model is proposed for the estimation of the FOS of slopes with different slope geometries and rock mass properties. The reliability of the proposed stability model is tested against numerical solutions. The results show that FOS estimated from the proposed stability model exhibits only 5.6% average relative discrepancy compared with numerical solutions based on 1254 sets of data. The proposed stability model is simple and effective, and can be used for the preliminary assessment of rock slope stability, considering the effects of different degree of blast damages.

Keywords: Hoek-Brown criterion, Blast damage factor, Blast damage zone thickness, Weighting factor, Stability charts

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