Numerical Simulation Study on the Effect of Rock Bolt Support Patterns on Shock Isolation in Deep-Buried Chambers (Postprint)

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Abstract

Compared with shallow-buried chambers, the high in-situ stress phenomenon resulting from increased burial depth renders safety assessment of deep-buried chambers more complex. This study, premised on in-situ stress equilibrium, employs a combined finite-infinite element method to design and optimize the rock bolting pattern for deep-buried chambers under impact loading. The computational results demonstrate that: following the balancing of initial in-situ stress, Mises stress exhibits a slight increase with the augmentation of rock bolt length and density. When rock bolt length and density increase to a certain threshold, the displacement and plastic strain of the chamber wall attain minimum values, and the chamber surrounding rock reaches a relatively safe state. Under staggered rock bolt arrangement, increasing the quantity of long rock bolts enhances the safety of the chamber surrounding rock. When reinforced support is applied to the chamber arch foot, the displacement of the entire wall is reduced.

Full Text

Preamble

The original text in this section is extensively corrupted by OCR errors and contains no coherent content that can be meaningfully translated. The majority of the material consists of garbled characters, fragmented symbols, and corrupted mathematical placeholders without contextual structure.

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