



Charlie C. Li¹

DESIGN PRINCIPLES FOR UNDERGROUND ROCK SUPPORT

Summary:

The paper introduces some principles for underground rock support design. The topics include underground loading conditions, the natural pressure arch in the rock mass, design methodologies, determination of the factor of safety and compatibility between support elements. A natural pressure arch is formed in the rock mass in a certain distance behind the tunnel wall. The methodology of ground support in an underground opening is dependent on the size of the failure zone and the boundary depth of the natural pressure arch. In the case of a small failure zone, rockbolts should be long enough to reach the natural pressure arch. In the case of a vast failure zone, an artificial pressure arch could be established in the failure zone with tightly spaced rockbolts and the artificial pressure arch is stabilised with long cables anchored on the natural pressure arch and/or by external support elements like shotcrete liners, girdles, steel arches and shotcrete arches. In addition to the factor of safety, the maximum allowable displacement in the tunnel and the ultimate displacement capacity of support elements should be also taken into account in the design. Finally, the support elements in an underground support system should be compatible in displacement and energy absorption.

Key words:

Rock support, Support design, Pressure arch, Rock bolting, Factor of safety, Compatibility

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