

Abstract

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Application of The Convergence – Confinement Approach to Analyze The Rock – Lining Interaction in Tunnels (Case Study: Shimizu Tunnel)

The Convergence-Confinement approach is a procedure in which the ground-liner interaction is analyzed by considering the behavior of the ground and the lining independently. This method enables calculation of average radial pressure applied to the support by the intersection of two curves representing the radial stresses as a function of radial strain, one for the ground; the other for the liner. This paper discusses the application of the Convergence-Confinement method of tunnel analysis to rock masses that satisfies the Hoek-Brown failure criterion. The Shimizu Tunnel has been studied using this method to analyze the structural interaction between rock; different types of individual support systems such as steel ribs, shotcrete, rock bolts; compound systems of these supports. The equations that govern the behavior of the rock-support interaction are given through two basic components of the Convergence-Confinement method which are, Ground Reaction Curve (GRC); Support Characteristics Curve (SCC). According to the analytical results, a comparison has been conducted between the different support systems according to the maximum capacity pressure of the support; the estimated lining load based on the Convergence-Confinement method. The value of this load depends on the timing of lining installation; consequently the value of the ground radial displacement due to the releasing of stresses.