The response of Rock Tunnel When Subjected to Blast Loading: Finite Element Analysis

Mohammad Zaid[1] and Md. Sadique[1]

[1]Aligarh Muslim University Faculty of Engineering and Technology

May 5, 2020

Abstract

Tunnels had been undergone accidental and intentional blast in the past. An analysis of a rock tunnel when subjected to internal blast loading has been presented in this paper. A three-dimensional finite element model of a huge rock mass comprising the tunnel has been developed in Abaqus/CAE. Diameter of the tunnel has been kept constant to a two-lane transportation tunnel. However, liner thickness of the concrete, overburden pressure on the tunnel has been varied to observe the response in different possible conditions. To incorporate the elastoplastic response of rock mass, Mohr-Coulomb constitutive material model has been considered. For modelling of trinitrotoluene (TNT), Jones-Wilkins-Lee material model has been adopted. Concrete Damage Plasticity material model has been adopted for tunnel lining. For the blast loading, Coupled-Eulerian-Lagrangian (CEL) model has been considered. Results highlight the importance of tunnel lining thickness and overburden depth while designing the tunnel in rocks. Under any amount of explosive, deep tunnels have been found to be safer than shallow tunnel.

Hosted file

`Engineering Reports.pdf` available at https://authorea.com/users/296104/articles/424962-the-response-of-rock-tunnel-when-subjected-to-blast-loading-finite-element-analysis