Half Tunnel Rockfall Simulation in Himalayas Region- A DEM Approach

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Abstract: **Rock fall in Himalaya is very common particularly along the road cut slope. Rapid development has aggravated this problem to a greater extent due to poor planning of the excavation cycle or having unscientific design of drilling and blasting technology. Sometimes, it is difficult to completely remove the rock mass along the road and leave overhauling half of the tunnel. It is important to ensure the safety of man and machinery passing through these roads. Some of them are hanging for a long period without any kind of support or some may be partially supported using rock bolts, shotcrete or wire mesh to avoid any block fall or arrest the rock at appropriate place. These are mainly based on rock mass classification systems to provide support for long term stability and sustainability for a better prediction; numerical techniques offer a more vivid solution as compared to conventional methods of stability assessment. Mainly slopes are simulated using various methods like finite elements method (FEM) finite difference method (FDM) and distinct element method (DEM). These are quite useful and advantageous due to their variability, economics and time. It does not require many assumptions that are an inherent part of the conventional slope stability tools. We have selected a case study from National highway 05 between Tranda in Kinnaur District and Jeore in the Shimla District Himanchal Pradesh, India.**

The rock mass encountered mainly variable schistose rock having more than 3-sets of distinct joints. The weak plane has high persistence, and slope has been observed to be moderately weathered and under damp conditions. Samples were collected from the site for characterization of geo-material based on geometry and rock joint parameters, rock mass properties to simulate using distinct element modelling with rockfall simulator were used to understand the falling block characteristic from the overhang of the Slope model.

The evaluated impact energy of the falling block as well as number of fragmented rock and highly vulnerable or about to fall block which can be removed using controlled blasting. This will add to stabilize the slope against the potential failure.

Keywords: ***Rockfall, Slope stability, Distinct Element Method (DEM), Rock mass characterization, Rockfall simulation, Controlled blasting, Schistose rock, Slope stabilization.***