

An Indian-Australian research partnership



Industry sponsored project by BHPB

Project title: Investigation of permeability of fractured, steep and deep rock slopes with high groundwater pressures

Project number: IMURA0074

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Research Academy theme/s

List only the research academy theme/s that is relevant to the project

1. Infrastructure engineering
2. Clean energy

The research problem

Understanding of the processes governing the mechanics, and the transport of fluids in, fractured rocks govern our ability to construct safe and economical structures including underground and open-cut mines and rock caverns, to recover oil/gas, mineral and metal resources, and to store safely contaminated materials in deep underground sites. When fluid flow is governed by fractures, the interconnectivity and the density of fractures play the most important role, since they provide the multiple flow paths that conduct water through the rock mass. Apart from this, the stability of rock mass decreases with the degree of interconnectivity. For instance, particularly in underground constructions, deep open cut mines, catastrophic tunnel/mine roof and longwall failures may occur, if the fractures transport abundant water to generate excess internal water pressures that substantially reduce the effective stresses at the boundaries of the mine opening.

Despite significant advances in the study of rock mass behaviour over the past three decades, our understanding of the effects as the result of the interaction of various mechanisms and processes such as stress redistribution and the motion of fluids in fractured rocks, fluid-rock interactions, the interaction between rock and reinforced materials such as rock bolts, our ability to both characterize material properties and to project system response at the field scale remains limited. Major problem with existing methods is that it does not identify the influence of fracture network within a large rock mass. In addition, the critical issue of scale effects, such as how to relate properties measured in the laboratory to rock mass properties at the field scale, has not been rigorously examined.

Project aims

The main aims of the project:

- (1) To estimate mechanical and permeability parameters of intact rocks and to study of a fundamental understanding of the large-scale flow properties of rock;
- (2) To develop design tools to model that can be used to predict fluid flow in rock media in field scale

Expected outcomes

The expected outcomes and benefits include:-

The proposed research project will provide critical technical data on:

- (1) Improved understanding of the mechanisms of flow properties through fracture systems at various depth levels;
- (2) Development of new design tools and to improve the existing codes to quantify the flow systems

Which of the above Theme does this project address?

This project will address the main research themes on (1) Infrastructure engineering - the design and modelling of large and deep open cut mines as well as underground longwall mining .

How will the project address the Goals of the above Themes?

This proposal is directed mainly towards the following categories: Surface and Underground and Environmental. It comes under the infrastructure engineering and clean coal/minerals technology.