GUEST EDITORIAL

Rock Mechanics Frontiers & Tunnelling Technology for Infrastructure Development

Inspite of the innovative technological inputs devised through experience, rock has the potential of springing up surprises. In view of this, it becomes imperative that advancement in technology is made through pooling of experience and resources, which can be achieved largely through well-established platform, so that an information base is built up for future reference and application. The Indian Society for Rock Mechanics and tunnelling Technology (ISRMTT), in its existence for over a decade now, has proved to be a very useful forum for interaction and promotion of information and technology for practising engineers, professionals and researchers.

India is now building a number of large dams and underground power houses in the Himalayas, with the mountains exhibiting geologically complex formation on account of development of faults and fracture zones. The Himalayas also offer one of the largest networks of roads anywhere in the world demanding hill development and landslide studies. With the recent accent on faster development of surface communication infrastructure, the railways and highways are confronted with a mounting need for extensive tunnelling in the mountainous zones. Several railway tunnels are built in tortuous mountainous terrains, such as Konkan railway and Jammu-Srinagar reaches. Underground metro transportation in several major cities of the world and now in Kolkata and Delhi is becoming a dire necessity and its calls for appropriate tunnelling technologies. Our combined expertise in the fields of rock mechanics, rock support design, hazard and risk assessment, remote sensing and engineering geological mapping will enable us to assess the key parameters diligently from the start of a project and would go a long way in optimising designs and execution.

The emerging trends in the field of rock mechanics now lay stress on practical risk assessment based on hazard severity and its probability of occurrence, coupled with stress on adequate coverage of mishaps. It is also increasingly being felt that design parameters such as modulus of deformation, poly-axial strength, insitu stress, etc. must be estimated by conducting adequate number of insitu tests. This needs to be augmented by the numerical modelling of rock mass and appropriate instrumentation. In order that mega projects are optimally designed and implemented with no time and cost over-run, this has to be given utmost importance by all concerned.

In the tunnelling front, to some extent Tunnel Boring Machine (TBM) has revolutionised the art of Tunnelling. Commendable rate of excavation have been reported in tunnelling. In Himalayan terrain, though deployment of TBM can bring about speedy execution of tunnelling through reasonably competent rock with little water ingress patches of shear zones, but water flowing masses can render TBM unsuccessful. In such cases, drill and blast method continues to be useful.

In the latest developments in tunnelling methods, various innovations, such as the ground improvement technology to stabilise fractured unstable faces, new ways of forepoling and introduction of positive shield shell-mounted TBM have been witnessed. Various alternatives to the common rock bolts, such as Weidmann GRP-Rockbolts, have been successfully implemented in a variety of projects. Greater acceptance of viable technologies of proven track record should help in faster and safer underground excavation works.

In water resources sector, hydropower development demands extensive sub-surface excavations for caverns for housing transformers and generating equipment and larger openings for surge system. Desilting also requires long, wide and deep caverns. When a number of these are aligned parallel, some development of additional cracks in the already excavated caverns have been observed. There is a need to examine the interaction between caverns, intermediate rock pillars, their size and spacing and rock support measures. Blasting techniques and rock supporting systems are to be developed specific to the local conditions. Strict adherence to specifications and constant interaction with designers is essential. Though SFRS has been successfully used elsewhere in a number of projects, it has been reported to be successful in a few tunnels only in India. This calls for specific attention. Some tend to conclude that the rocks fully supported with steel sets and embedded in concrete is the desirable solution in the Himalayas, which is not well founded and has very little justification. For absorbing deformations in rock mass of low quality, a method seemingly preferred now is to construct reinforced ribs of sprayed concrete spaced suitably.

A more dynamic linkage between the ISRMTT and other established national and international institutions would give better insight and global perspective in the art of tunnelling.

This issue of the journal contains a number of informative and useful articles contributed by authors with wide experience in their respective areas. I am sure the readers would find the issue relevant, interesting and it meets their expectations.

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