Rock Mechanics Challenges and Tools for Deep Tunnelling

Typically, rock mechanics data is collected and analysed in a similar manner for most tunnelling and underground construction works, independent of the critical engineering geology and associated instability modes that are anticipated for the project. This workshop will present a mechanistic-based approach to manage rock mechanics risk in tunnelling and underground engineering, where consideration of the anticipated behaviours (and associated engineering choices and analysis options) directs detailed site investigation, formal definition of contractual predictions, and subsequent analyses and monitoring prior to and during construction.

Proposed Agenda

- Workshop Intro
- First Steps: Understanding Possible Rock Failure Modes and Mechanics
- Design Toolbox: Rock Excavation Construction and Ground Support Options
- Analyses Options: Rock Mechanics Modelling Approaches for Tunnel Engineering
- COFFEE
- Characterisation: Parameters and Approaches – Targeting the Right Information
- Prediction: Rock Mechanics and Geotechnical Baselines (Defining Expected Ground Conditions and Behaviours)
- Closing the Loop: Observational Design for Deep Rock Tunnelling (Managing Uncertainty)
- Discussion and Closing

Instructor Biographies

Dr. Mark Diederichs, PhD., PEng, FEIC, FCAE, ARMA Fellow

Professor, Geological Sciences and Geological Engineering, Queen's University
President and Principal, Innovative Geomechanics Incorporated
Kingston, Ontario, Canada

Mark Diederichs has been an international rock mechanics and rock engineering consultant for over 30 years and has been a professor at Queen's University since 2001. He specializes in rock mechanic related to underground excavation in soft and hard rock, swelling and squeezing ground and well as brittle and bursting conditions. His research is aimed at elevating the rock engineering practices of the underground construction industry to state-of the-art in rock characterization, modelling, design and monitoring. He has supervised over 90 research graduate students in these areas, published over 400 technical papers in rock mechanics and is an international rock engineering consultant working on 5 continents.

Alexandre (Alex) Gomes, B(ECivil), PEng

Chief Technical Principal Tunnels and Underground Works, SMEC Pty
Sydney, New South Wales, Australia

Alex Gomes is a civil engineer with over 30 years' experience in the design and construction of tunnel and underground works and applied geotechnical and geomechanical engineering. Alex has provided notable contributions to major international tunnel projects for transportation, mining, water and energy across all continents, including multiple long and deep tunnels and caverns in rock. He worked for 25 years with Geoconsult Austria, becoming the managing Director of Geoconsult Latinoamerica, with HQs in Chile. Since 2017 he joined SMEC, in Sydney, where he provides technical leadership and advice on technical and contractual aspects of underground works for many of SMEC's tunnel projects in Australia and in the world. He is a past Vice-President of the International Tunnelling & Underground Space Association ITA-AITES, ITA-CET lecturer, former adjunct professor of tunneling at the University of Chile. Alex published several technical papers and articles and delivered lectures and training activities for engineers worldwide.

Dr. Erik Eberhardt, PhD, PEng

Professor of Rock Mechanics and Rock Engineering
Director of the Geological Engineering program at the University of British Columbia

Erik Eberhard has been an international rock mechanics consultant for over 25 years and has been a professor at the University of British Columbia since 2004. Erik specializes in the integration of geology, geotechnical monitoring and numerical modelling to better understand the underlying mechanisms responsible for complex rock mass responses to engineering activities. He was the Associate Director of the Rio Tinto Centre for Underground Mine Construction, and actively consults on tunnelling and mining projects in North America, South America, Europe, Australia and Asia. He is a past recipient of the Canadian Geotechnical Society's John A. Franklin Award for outstanding technical contributions to rock mechanics, and the Canadian Institute of Mining's Rock Mechanics Award for significant and lasting contributions in rock engineering for the benefit of the mining industry.

Dr. Brendan Fisher, PhD, PEng

Principal at Fisher Rock Engineering, LLC
Technical Director (Geological Engineer Specialty) at Tetra Tech Canada Inc.

Brendan Fisher has been an international rock mechanics consultant for about 20 years and has been a principal of Fisher Rock Engineering/Fisher Strickler Rock Engineering, LLC since 2008. He recently accepted a position at Tetra Tech within their Engineering Group providing consulting services for civil and mining rock engineering projects. Dr. Fisher's consulting practice focuses on rock mass characterization and numerical modeling for surface and underground excavations. His PhD research was on geotechnical failure mechanisms, data collection, evaluation and geotechnical uncertainty associated with rock slopes and open pit wall design.