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- Topic:** High Strain Rate Characterization of Rocks and its Application in Blast-Analysis of Tunnels
- Speaker:** Dr. Sunita Mishra, Assistant Professor, Mining Engineering, Indian Institute of Technology (IIT) Kharagpur, India
- Date and Time:** 10/02/2022, Friday, 12.00 PM to 1:00 PM (IST)
- Webinar link:** meet.google.com/iqy-iyjh-xaj
- Hosts:** Prof. Sunil Manohar Dash, IIT Kharagpur, and Prof. Kim Boon Lua, NYCU Taiwan

Abstract

Geologic formations, with their diversified hard and soft rock mass, have always posed challenges to the construction of tunnels and underground structures. Infrastructure in the mountains and deep underneath the ground are subjected to static overburden loads from self-weight of soil and rock and loads caused by extreme events like earthquakes and blasts that are highly transient in nature and generate high strain rates in the rock mass. The presentation includes a brief discussion on the mechanical behaviour of ten types of rocks under high loading. The high strain rate characterisation of these rocks is done for two different diameters, and five different slenderness ratios of the rock specimens using a 76 mm diameter split Hopkinson pressure bar (SHPB) device in an effort to understand the standard specimen dimension for the SHPB test. The rock specimens' stress-strain responses are studied systematically by varying the length of the striker bars and the gas gun pressure values. The petrological and static characterisation of the rocks is also carried out to assess the response of the rock specimens. Finally, a methodology is proposed to characterize different rock specimens under a high loading rate. Further, numerical simulations of the SHPB test on these different types of rocks are performed using the strain rate-dependent Johnson-Holmquist (JH-2) model available in the finite element software package LS-DYNA. The simulation results are compared with the experimental data; thus, the parameters of the JH-2 model are determined. The determined parameters are then used in blast analysis of tunnels subjected to 20 kg TNT explosive, and the results are studied.

About the Speaker



Dr. Sunita Mishra is an Assistant Professor in the Department of Mining Engineering at the Indian Institute of Technology (IIT) Kharagpur, where her research focuses on understanding the fracture propagation in rocks under dynamic loads, development of novel cutting techniques for maximizing the productivity in coal mines and dynamic pull tests of rock bolts. Prior to that, she was a Postdoctoral Fellow in SIMLab, CASA: Center for Advanced Structural Engineering at Norwegian University of Science and Technology (NTNU), Norway, where she gained expertise in the analysis of experimental and numerical pullout response of anchors cast in concrete. She completed her Ph.D. in the area of Rock Dynamics from the Department of Civil Engineering at the Indian Institute of Technology (IIT) Delhi, India. She strongly condemns anti-national activities, and for the betterment of the nation against cross-border terror, she has developed the database for the high strain rate response of ten major rocks found all over India, which can be used effectively for the blast-resistant design of underground structures. In her Ph.D. career, she has designed a machine that is used for high strain rate characterization of heterogeneous materials. She has published several papers in top-tier international journals and conferences. She has also won many international and national awards for the work conducted in her Ph.D. and thereafter. Her Ph.D. work has also been appreciated by the media due to its high significance in safeguarding our country against terror. Her other research interests lie in experimental rock dynamics, rock mechanics, pullout tests of rock bolts, the design of underground structures, blast-resistant design, and mechanized tunneling methods.

Admission is free. All are welcome to attend.