

Rock Mechanics & Rock Engineering

Expertise Rock Mechanics, Mining Engineering

Education Ph.D. (Rock Mechanics), 1999
Licentiate in Engineering (Rock Mechanics), 1992
Master of Science in Geotechnology, 1988
Luleå University of Technology (Sweden)

Professional Experience

2011 - Present *Itasca Consultants AB, Luleå, Sweden*
General Manager, Principal

2007 - Present *Luleå University of Technology, Luleå, Sweden*
Adjunct Professor in Rock Mechanics and Rock Engineering

2009 - 2011 *LKAB, Luleå/Kiruna, Sweden*
Senior Researcher, Rock Mechanics

2007 - 2009 *Vattenfall Power Consultant AB, Luleå, Sweden*
Rock Mechanics Consultant

2000 - 2006 *SwedPower AB, Luleå, Sweden*
Rock Mechanics Consultant

1998 - 2000 *Boliden Mineral AB, Boliden, Sweden*
Rock Mechanics Engineer

1994 - 1998 *Luleå University of Technology*
Doctoral Student, Division of Rock Mechanics

1988 - 1992 *Luleå University of Technology*
Doctoral Student / Research Engineer, Division of Rock Mechanics

1992 - 1994 *Itasca Consulting Group, Inc., Minneapolis, Minnesota*
Staff Engineer

1987 *LKAB, Malmberget Mine, Sweden*
Field Measurement Assistant

1986 *LKAB, Malmberget Mine, Sweden*
Trainee

Project Experience

Infrastructure (Tunneling): Detailed design work for the Citybanan (City Link) commuter-train tunnel project in Stockholm (Internal Project Leader). Rock mechanics analysis of bridge foundation over open-mine stopes for a new railroad in Kiruna. Evaluation, interpretation and analysis of all rock stress measurements in the Stockholm area in order to obtain design data for the Citybanan project. Numerical analysis of shotcrete reinforcement in rock tunnels, using two- and three-dimensional models for the simulation and evaluation of shotcrete in tunnel design work.

Developed design guidelines for railroad tunnels in rock for Banverket (the Swedish Railroad Administration), and R&D-coordinator for Swedish Railroad Administration research program for tunnels and rock cuts, and corresponding handbooks.

Numerical analysis using *UDEC* and *3DEC* to study the mechanism of block separation in rock culverts under railroad embankments.

Nuclear Waste Disposal: Site-model design review for nuclear waste repositories. Participation in the “Olkiluoto Modelling Task Force” for the construction of a spent nuclear fuel final-storage facility in Finland. Three-dimensional boundary element analysis using *EXAMINE^{3D}* of tunnels at the Äspö Hard Rock Laboratory, Sweden.

Hydropower: Stability assessment of the rock abutment at the Vargfors hydropower dam, including borehole logging, assessment of rock and joint shear-strength properties, and review and update of stability calculations for the rock abutment. Technical reviews for the Rio Estí (Panama) hydropower plant construction.

Stress Measurements: Project leader for rock stress measurements using overcoring in various projects in Sweden and Finland, including both shallow and deep boreholes, as well as the application of hydraulic fracturing. Investigation of core diskings and overcoring rock stress measurements in high-stress environments through field testing (drilling and overcoring) and analyses. Development of a methodology for analysis and quality control of rock stress measurements in anisotropic rock.

Mining: Numerical modeling using *3DEC* focusing on the potential for fault-slip seismic events for different mining scenarios. Scenario description of caving and crown-pillar stability comprised of data compilation, analysis of seismicity data and empirical assessment of stope stability and caveability. Project manager for a research project on deformation measurements using radar satellite technology (InSAR technology) with the purpose of detecting mining-induced ground deformations. Responsible for rock mechanics work related to mining-induced (from sublevel caving) ground deformations. Three-dimensional forensic numerical modeling using *3DEC* for a rockburst fatality. Three-dimensional stress modeling for complex excavation geometries (chute drifts, crusher chamber) for a new major haulage level in a deep underground mine.

Stability assessment and design of rock slopes, and for several large and medium-size open-pit mines in northern Scandinavia and Spain, including technical review, blast design, drainage design, geomechanical characterization, slope monitoring, and extensive two-dimensional numerical modeling. Member of Panel of Experts for slope design at an open pit in Norway, Peer-review of design study for a mine in Chile.

Review of design, excavation, and maintenance of shafts and ore passes under high stress conditions, and study of orepass stability in an underground mine, including site data collection, numerical analysis of orepass stability, identification of failure mechanisms, prognosis of future stability conditions, and assessment and recommendation of remedial measures and follow-up. Bulkhead design for a near-surface mine drift, to prevent flooding of the mine. Examination of sill-pillar rockbursting in underground mines. Investigation of fractured rock-mass response to dynamic loading by fault slip. Development of design methods for stope roofs and sill pillars in cut-and-fill and open-stope mining. Numerical analysis of stope-and-pillar stability in large-scale open-stope mining

Member of the Peer Review Panel for numerical simulation of the Aznalcóllar tailings dam failure in southern Spain.

Teaching and Academic Experience:

(All teaching experience at Luleå University of Technology, unless otherwise noted.)

Member of the executive group for HLRC—the Hjalmar Lundbohm Research Centre (funded by LKAB) at the Luleå University of Technology (2010)

Opponent at Guro Grøneng's presentation of her doctoral thesis at the NTNU University in Trondheim (2010).

Assistant supervisor for two graduate students (doctoral thesis) with planned Ph.D. degree in 2011 and 2012; Supervisor for graduate student (doctoral thesis) on a project dealing with the strength of hard rock masses, including strength estimation and numerical modeling (2004-2008); Supervision of several undergraduate thesis projects — e.g., application of digital photogrammetry for mapping of joints, several projects on overcoring rock stress measurements, rock erosion in spillwater channels, and various underground mining design projects.

Review of applicants for the position of adjunct professor (Professor II) at the Department of Geology and Mineral Resources Engineering, Norwegian University of Science and Technology (2007). Review of applicants for the position of associate professor (university lecturer) at the Division of Rock Mechanics, Luleå University of Technology.

Teaching of Sandvik International Mining School students on rock mechanics in sublevel cave mining (2009, 2010).

Planned and gave several postgraduate courses e.g., on rock stress measurements, slope stability, and numerical modeling (1997 to present).

Instructor of undergraduate students in civil and mining engineering at Luleå University of Technology, including classes on fundamental rock mechanics, stability and design, monitoring, numerical analysis, rock reinforcement, and probabilistic design (1989 to present).

Assisted in training of numerical modeling using *FLAC*, *UDEC* and *3DEC* for Itasca Consulting Group, Inc. (1994).