

Geotechnical Engineering

Expertise	Geotechnical Engineering, Slope Stability, Numerical Modeling
Education	Ph.D. (Civil Engineering), 1984, University of Minnesota M.S.C.E., 1975, University of Illinois B.S.C.E., 1973, Valparaiso University
Registrations	Registered Professional Engineer, States of Illinois, Maryland, Minnesota and Pennsylvania
Professional Affiliations	Member: Tau Beta Pi, International Society for Rock Mechanics
Honors	Consulting Engineer's Council Scholarship National Award (1973) Golder Associates Prize (1984), Best Paper, ISRM Symposium on Design and Performance of Underground Excavations Indian Society for Rock Mechanics and Tunnelling Technology (1996), Best Paper, Underground Space Technology
Keynote Lectures	2009, <i>Slope Stability 2009, Santiago, Chile</i> 2008, <i>Barrick Geomechanics & Hydrogeology Conference, Elko, Nevada</i> 2008, <i>1st International FLAC/DEM Symposium, Minneapolis, Minnesota</i> 2007, <i>ISRM World Congress, Lisbon, Portugal</i>
Professional Experience	
2008 - Present	<i>Itasca International, Inc., Minneapolis, Minnesota, Chief Executive Officer</i>
	<i>Itasca Consulting Group, Inc., Minneapolis, Minnesota</i>
2008 - 2010	<i>General Manager</i>
1998 - Present	<i>Principal Mining Engineer</i>
1995 - 1997	<i>Senior Mining Engineer</i>
1985 - 1993	<i>Manager, Civil Engineering</i>
	<i>Itasca S.A., Santiago, Chile</i>
1997-2008	<i>General Manager & Principal Engineer</i>
1993 - 1995	<i>Technical Manager & Senior Project Engineer</i>
1984 - 1985	<i>CSIRO Division of Geomechanics, Melbourne, Australia</i> <i>Senior Research Scientist</i>
1983 - 1984	<i>Charles Nelson and Associates, Minneapolis, Minnesota, Design Engineer</i>
1982 - 1983	<i>Howard, Needles, Tammen and Bergendoff, Minneapolis, Minnesota</i> <i>Tunnel Engineer</i>
1980 - 1982	<i>University of Minnesota, Department of Civil and Mineral Engineering</i> <i>Research Fellow</i>
1976 - 1980	<i>A. A. Mathews, Inc., Rockville, Maryland, Assistant Vice President</i>
1973 -1976	<i>University of Illinois, Department of Civil Engineering</i> <i>Research Assistant</i>

Project Experience

Rock Mechanics Applied to Surface Mining: Consulting, field and numerical modeling projects for diverse problems at some of the largest open-pit mines in the world, including Chuquicamata, Collahuasi and Escondida (Chile), Jwaneng (Botswana), and Toquepala and Cuajone (Peru). Surface-mining activities: estimating rock mass properties, calibrating numerical models in two and three dimensions for slope-stability assessment, back-analyzing slope failures, and specifying remedial measures (dewatering, buttresses, step-outs, etc.). Static and dynamic analysis of tailings dams and dikes in highly active seismic areas, including assessment of stability and liquefaction potential of saturated sands and interpretation of laboratory test results to estimate soil properties. (Representative projects include Torito dam, Ovejeria dam, Qillayes dam and retaining dikes at Escondida Mine, all in Chile.) Numerous subsidence analyses (both mining- and dewatering-induced) for surface and underground mines. Member of Geotechnical Review Board for Cerro Colorado Mine (Chile). Itasca project manager for Large Open Pit project, an international research and technology transfer project on the stability of rock slopes in open pit mines. Lead author for Slope Design Methods (chapter 10) of *Guidelines for Open Pit Slope Design* (2009).

Rock Mechanics Applied to Cave Mining: Consulting and numerical modeling projects for diverse problems in cave mining, including management of Itasca's involvement in the first phase of the International Caving Study, a worldwide study aimed at improving the understanding and performance of caving. Calibration of regional stress fields, extraction-level layout assessment, evaluation of caving potential and fragmentation, evaluation of ground-support methods and panel sequencing, and prediction of gravity flow of broken ore. Consulting services for Argyle Mine and Northparkes Mine (Australia), Henderson Mine (United States), Premier Mine, Finsch Mine and Koffiefontein Mine (South Africa) and Andina, Chuquicamata and El Teniente Mines (Chile).

Geomechanics Applied to Civil Engineering: Consulting and numerical modeling for diverse problems in civil engineering. Collection and assimilation of geomechanical data, development of numerical models to represent problems and analysis/interpretation of results. Representative activities include analysis of rockfill dam settlement (Bennett Dam, Canada), slope-stability analysis at Paiton power project (Indonesia) and Revelstoke Reservoir (Canada), analysis of stacked tunnels for Rio Piedras metro station (Puerto Rico), analysis of large detector-hall caverns for physics research, analysis of multiple parallel caverns at shallow depth (Finland) and analysis of an underground powerhouse complex for the Sogamoso hydroelectric project (Colombia). Extensive research in the engineering properties and numerical representation of shotcrete (reinforced and unreinforced), rock bolts, cable bolts and soil nails. Member of the Board of Consultants for Clearwater Dam (USA).

Numerical Modeling in Geomechanics: Presentation of over 50 courses, in more than 15 countries, on numerical modeling methods, focusing on the application of numerical models to practical problems in mining and civil engineering. Instructor for graduate-level university courses in the United States, Sweden, Finland and Chile. Author and co-author of more than 45 technical articles.