

# ***Richard K. Brummer***

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## **Rock Mechanics, Risk Assessment, Mining Engineering**

<b><i>Expertise</i></b>	Rock Mechanics, Risk Assessment, Geomechanics Instrumentation, Mining Engineering, Numerical Modelling
<b><i>Education</i></b>	D.Eng. (Doctor of Engineering) Rand Afrikaans University, Johannesburg, South Africa, 1988 BComm (Hons), 1990 M.Sc. (Engineering), 1980 B.Sc. (Engineering), 1977 University of the Witwatersrand, Johannesburg, South Africa
<b><i>Registration</i></b>	Registered Professional Engineer, Professional Engineers Ontario, Canada Designated Consulting Engineer, Professional Engineers Ontario, Canada Certificate of Authorisation to Practice, Professional Engineers Ontario, Canada Registered Professional Engineer, South Africa
<b><i>Professional Affiliations</i></b>	Member: Canadian Geotechnical Society; Canadian Institute of Mining, Metallurgy and Petroleum; South African Institution of Civil Engineers; South African Institute of Mining and Metallurgy; Institute for Risk Research; International Society of Rock Mechanics.
<b><i>Honors</i></b>	1990 Manuel Rocha Medal, International Society for Rock Mechanics
<b><i>Professional Experience</i></b>	
<i>1999 - Present</i>	<i>Itasca Consulting Canada Inc., Sudbury, Canada, President</i>
<i>1992 - 1998</i>	<i>Richard Brummer Associates, Sudbury, Canada, Consulting Geomechanics Engineer</i>
<i>1992 - Present</i>	<i>Laurentian University, School of Engineering, Adjunct Professor</i>
<i>1992 - 1995</i>	<i>Laurentian University, Geomechanics Research Centre, Associate Director</i>
<i>1990 - 1992</i>	<i>Golder Associates Ltd., Consulting Engineers, Toronto, Canada, Senior Rock Mechanics Engineer</i>
<i>1989 - 1990</i>	<i>University of the Witwatersrand, South Africa, Department of Mining Engineering, Senior Lecturer</i>

**Professional Experience (continued)**

1981 - 1988	<i>Chamber of Mines of South Africa Research Organisation, Rock Mechanics Laboratory, Principal Engineer/Head of Rock Mechanics Section/Chief of Rockburst Division</i>
1981	<i>City Council of Pretoria, Office of the Chief Design Engineer South Africa, Resident Engineer</i>
1979 - 1980	<i>South African Defence Force, Commissioned Officer (Compulsory National Service)</i>
1978	<i>University of the Witwatersrand, South Africa, Department of Civil Engineering, Postgraduate Research Assistant</i>
1977 - 1978	<i>Ove Arup and Partners, Consulting Engineers, Johannesburg, South Africa, Graduate Engineer</i>

**Project Experience**

*Rock Mechanics Applied to Underground Mine Design:* Consulting, field work and numerical modelling projects for underground mines, including stope design, economic optimization, rock mass classification, rockburst risk evaluation and prevention, pillar design, backfill strength and properties, seismic monitoring, risk assessment, determination of ground support methods and investigation of roof stability problems. Design and economic optimization of mine layouts, including method selection and stope sequencing for a variety of mining methods including blasthole stoping, VRM mining, cut-and-fill, longwall and room-and-pillar mining in Canada, USA, South America and Southern Africa. Development and application of numerical modelling methods for various mine design problems, including dynamic analyses, the effects of stiff fill, destressing methods, reinforced and unreinforced backfills, excavation and pillar stability, and fault-slip rockburst mechanisms.

*Rock Mechanics Instrumentation Systems:* System Design, Planning, Installation, Commissioning and Operation for numerous geomechanics instrumentation projects for measuring rock stress, displacement, pressures, temperatures, loads, blast monitoring, gas outbursts, vibrations, etc., in hard-rock and soft-rock mines and industrial plants in Canada and South Africa. Developed stand-alone seismic and vibration recording systems for research projects, routine in-mine monitoring, as well as robust industrial data-acquisition and control systems.

*Geomechanics Research Projects:* Numerous geomechanics field studies and investigations including destress blasting for rockburst control in South African gold mines, measurement of pressures behind and stresses in shotcrete walls, measurement of loads in shotcrete pillars, measurement of deformations around orepasses, measurement of pressures in backfill panels and pipelines, real-time drillhole monitoring, and blasting on fault planes for initiating seismic events.

*Numerical Model Development:* Developed boundary-element numerical models for the evaluation of rock fracturing around deep gold mine stope faces and the behaviour of stiff and soft fills in narrow stopes, finite difference numerical models of the behaviour of stiff and compressible timber packs and for elastic wave propagation in rock. Supervised the development of finite element models for non-linear rock failure and deformation modelling.