OBJECTIVES

> To document information regarding state of the art rock slope design and excavation
> To gather together the latest information regarding the application of probabilistic design and risk analyses of slopes
> To provide information on state of the art slope monitoring and maintenance techniques
> To present valuable, illustrative and interesting case studies.

BACKGROUND

Open pit mines are being planned to increasingly great depths, often beyond the current experience and knowledge base, with the exception perhaps of some very steep and high natural rock slopes. Despite recent advances, there remains significant challenges in understanding the mechanisms of slope behaviour and failure, and methods of stability analysis for such slopes. In an attempt to bring together the state of the art capabilities in these fields, as well as new research and developments, the South African Institute of Mining and Metallurgy (SAIMM) in collaboration with the South African National Institute of Rock Engineering (SANIRE) are organising a specialist international symposium on the Stability of Rock Slopes, to be held in Cape Town in October 2015. Cape Town is considered to be a very appropriate location for the symposium. There is a wide choice of hotels, within a few minutes walk of the symposium venue. In the area there are many steep natural rock slopes, and there are significant hard rock quarries within about an hour’s drive. Technical site visits to various natural slopes and the quarries will be arranged.

WHO SHOULD ATTEND

The symposium will address important developments in design, analysis, excavation and management of rock slopes. The organising committee will aim to provide a programme containing valuable and stimulating information. This should be of interest to:

> Geotechnical - rock engineers and engineering geologists
> All open pit mine personnel
> Mine management
> Consulting engineers
> Road and rail engineers
> Contractors
> Blasting specialists
> Research and academic personnel
> Hydrogeologists
> Manufacturers and suppliers of slope stabilisation equipment
> Slope monitoring and survey specialists
> Manufacturers and suppliers of slope monitoring and survey equipment and geotechnical instrumentation
> Government minerals and energy personnel
> Health and safety personnel and officials.

EXHIBITION/SPONSORSHIP

Sponsorship opportunities are available. Companies wishing to sponsor or exhibit should contact the Conference Co-ordinator.
CALL FOR PAPERS

The Conference is being organised by the Southern African Institute of Mining and Metallurgy, and individuals are invited to submit papers for the Conference. Titles and short abstracts (no more than 500 words) should be submitted in English to Head of Conferencing, Raymond van der Berg, via e-mail: raymond@saimm.co.za

Enquiries may be made at: Tel: +27 11 834-1273/7
Facsimile: +27 11 838-5923 or
E-mail: raymond@saimm.co.za
Website: http://www.saimm.co.za

TOPICS

Papers are invited on any aspect relevant to rock slopes. The following list of topics provides a guideline:

> Slope design criteria and design methods
> Slope failure mechanisms
> Risk analysis of slopes
> Rock falls—analysis and control
> Numerical stress analysis approaches in slope stability
> Slope monitoring techniques—seismic, radar, laser scanning, GPS, conventional, etc;
> Slope stability as a three dimensional issue
> Slope excavation—latest blasting techniques
> Support and stabilisation of slopes
> Groundwater issues in slope stability
> Slope management
> Financial aspects and slope stability
> Case studies.

KEY DATES

6 May 2015 Submission of final paper
12–14 October 2015 Symposium
Geomechanical assessment of trees and shrubs rootage reinforcing properties on slope stability
B.R. Rakishev, O.S. Kovrov, and V.V. Fedotov, Kzakh National Technical University and National Mining University, Dnipropetrovsk, Kazakhstan

Weathered banded iron formations in Vale iron ore mines on the western side of the Iron Quadrangle, Brazil: An overview of the geotechnical properties and the influence of matric suction on slope stability
T.A.V. Costa, K. Mercer, and P. Dight, University of Western Australia, Australia

Assessing the stability of the ‘731 Block’ Rock Slope, British Columbia, Canada
R. Macciotta and C.D. Martin, University of Alberta, Edmonton, Canada

Risk management of a large scale failure at MMG’s Century Mine, Northwest Queensland
E. Sweeney and K. Abbott, MMG’s Century Mine, Australia

Microseismic monitoring at MMG’s Century Mine, Northwest Queensland
M. Salvoni, K. Abbott, P.M. Dight, and S. Meyer, University of Western Australia and MMG’s Century Mine, Mine Seismologist at Institute of Mine Seismology, Australia

3D and 2D Radars for open pit slope monitoring
P. Bellott, D. Noon, D. Leva, and C. Rivolta, GroundProbe Pty Ltd, Australia and Ellegi srl, Italy

Introduction to a research project on decisive parameters for open pit slopes
K.H. Holmøy, K. Botsialas, and K.K. Panthi, SINTEF Building and Infrastructures, Titañia AS, NTNU, Norway

Effective slope management through process driven information management systems
M. Bester and F. Faul, Anglo American, South Africa

Effective use of slope monitoring radar to predict a slope failure at Jwaneng mine, Botswana
F. Ramsden, N. Coli, and P. Farina, Debswana Jwaneng Mine, Botswana and IDS Ingegneria dei Sistemi S.p.A., Italy

Geotechnical optimisation of Southern Ridge Cutback 3 at Rio Tinto Iron Ore Tom Price Operation

On the use of ground-based Synthetic Aperture Radar for long term slope monitoring and the use of mult scale techniques to support mine geotechnical team
A. Michelini, N. Coli, F. Coppi, P. Farina, L. Leoni, T.A. Costa, and T. Costa, IDS Ingegneria Dei Sistemi Spa Valentino S.A., Belo Horizonte Brazil

Quality data for mining geotechnical studies
S. Coetsee, SRK Consulting South Africa

Monitoring slope movement from space with robust accuracy assessment
M.D. Henschel, J. Dudley, B. Lehrbass, S. Sato, and B.M. Stöckel

30 Case Studies: Using Borehole data for Rock Mass Quality Assessment
A. Duran, Peils Sullivan Meymink Australia

Reconciliation of the mining value chain – mine to design as a critical enabler for optimal and safe extraction of the mineral reserve
M. Bester, J. van Heerden, and T. Russell, Anglo American, South Africa

PFC2D Numerical Simulation and Analysis of Slot Rock Instability Evolution
C. Shen, B. Lin, L. Zhang, and D. Wang, Mine Safety Technology Branch of China Coal Research Institute State Key Laboratory of Coal Mining and Clean Utilization China University of Mining & Technology, China

Using radar system to assess the effect of dewatering on slope stability
J. Vorster, M. Seidu, N. Coli, and P. Farina, ENRC Frontier Mine, DRC IDS Ingegneria dei Sistemi S.p.A., Italy DRC Italy

Dealing with difficult structures: data capture and wall design
A.N. Brown, D.E. McCormack, and W.D. Bartlett, Thiess Australia

Characterizing Intact Rock Strength using field estimates and field tests in banded iron formation of Western Australia
R.D.H. Thomas, Coffey International Limited Australia

Structural data collection from televiewer surveys
R.D.H. Thomas and J. Neilsen, Coffey International Limited Australia

Quantification of the Geological Strength Index - effects on open pit slope design
R.D.H. Thomas, Coffey International Limited Australia

A Comparison of Slope Stability Analyses in Two and Three Dimensions
D. Wines, Itasca Australia Pty Ltd Australia

Analysis of instabilities for areas with high structural control and the implication of moving averages using radar information
J. Calderon and R. Elgueta, Minera Escondida Ltda, Chile

How stable are angle of repose coarse-grained mine waste slopes?
D.J. Williams, The University of Queensland Australia

The Role of Groundwater Flow Modeling in Integrating Slope-Stability Analyses and Designing Depressurisation Systems at Debswana’s Jwaneng Mine, Botswana
H. Liu, L. Kgotlhang, J. Xiang, B. Maswabi, T. Balopi, and R.J. Sterrett, Itasca Debswana Diamond Company, USA and Botswana

A high rock cut stabilization in Oman: case history
T.M. Haya, T.J. Bhatti, and R. Goldsmith, National Engineering Services Pakistan (Pvt.) Limited, NESPAK SMEC, Pakistan, Australia
A methodology to evaluate geotechnical hazards in real space
D.J. du Plooy and E.C.F. Hamman, AngloGold Ashanti, Australia

B. Maswabi, L. Kgotlhang, T.R.R. Sterrett, and H. Liu
Itasca Debswana Diamond Company, USA, Botswana

Large-Scale Creep in Open Pit Slopes
J. Lupo and T. Byers, Newmont Mining Corporation, USA

Pit Slope Design Challenges in Residual Soils and Highly Weathered Rock
J. Lupo and M. Brunhart-Lupo, Newmont Mining Corporation, ReBel Consulting LLC., USA

Slope Management and Geotechnics at the Batu Hijau Mine, Indonesia
J. Lupo, Y. Adriansyah, H.D. Lelono, and I.B.D. Viriyatha
Newmont Mining Corporation, PT Newmont Nusa Tenggara, USA

Probability of Failure in Open Pit Slope Design
J. Venter,

Limit Equilibrium Analysis of a Planar Sliding Example in the Pilbara Region of Western Australia – Comparison of Modelling Discrete Structure to Three Anisotropic Shear Strength Models
J.M. Seery, AngloGold Ashanti, Australia

An overview of slope stability monitoring at Venetia opie pit, mine, Limpopo South Africa
M Mojalefa, The De Beers Group of Companies, South Africa

Using Advanced InSAR Techniques as a remote tool for mine site monitoring
D. Colombo and B. MacDonald, TRE Srl, Italy, Canada

A comprehensive & integrated slope monitoring approach for enhanced effectiveness: application at Debswana’s Jwaneng Mine in Botswana
F. Ramsden, E. Audigé, and C. Fagan, Debswana, Jwaneng, Soldata, Oceania, Botswana, Australia

Depressurisation for the Enhancement of Slope Stability at Debswana’s Orapa Mine, Botswana

Performing Blast Vibration Monitoring Utilizing Slope Stability Radar
P.J. Jenks, Barrick Cortez, USA

Slope deformation mechanics from microseismic monitoring
S. Meyer, Institute of Mine Seismology, Australia

Scale considerations for direct shear testing of coal mine spoil
L. Bradfield, J. Simmons, and S. Fityus, Thiess Pty Ltd, Australia

A trilinear shear strength envelope for coal mine spoil
L. Bradfield, J. Simmons, and S. Fityus, Thiess Pty Ltd, Australia

Stability analyses of the K03 Pit Wedge Structure – Venetia Mine Open Pit
R. Mathivha, The De Beers Group of Companies, South Africa

A practical methodology to define geotechnical design sectors in structurally controlled anisotropic environments
M. Bester, I. Basson, and D. Tennant, Kumba Iron Ore, South Africa

Cut 8 Dynamic Slope Management Process with emphasis on Structural Challenges at Jwaneng Mine, Botswana
H.T. Chiwaye, K. Mogotsi, K. Gabanakgosi, and F. Ramsden, Jwaneng Mine, Debswana Diamond Company Botswana

Practical Application of Geotechnical Solutions (Bowen Basin Case Study)
D.E. McCormack and L. Bradfield, Thiess Pty Ltd, Australia

Analysis of rock fall hazard in an open pit nickel mine.
M. Ferentinou and C. Jermy, University of KwaZulu Natal, Golder Associates (Africa) Pty Ltd, South Africa

French Expertise / Know-How in Geohazards and Rockfall protection
N. Villard and J.P. Monfort, GTS ELITE® (NGE) – Grenoble / Réunion Island (ROCS), French Cluster Montagne – Chambéry, France

Simulation of progressive rock slope failure due to seismically induced damage
A. Wolter, V. Gischig, E. Eberhardt, D. Stead, and J.J. Clague, ETH Zurich, University of British Columbia, Simon Fraser University Switzerland, Canada

Modelling Diurnal Fluctuations in Terrestrial Laser Scanning data for Slope Failure Monitoring
A. Afana 3D Laser Mapping Ltd, United Kingdom

Design of a Pit-highwall in highly weathered igneous material where the highwall will intersect old underground access tunnels
F.J.N. Bruwer, Anglo American, South Africa

A semi-quantitative risk assessment method for the design of open pit slopes subject to toppling
D. Kinakin and W. Newcomen, Kamloops, B.C., Canada

Savage River Mine: North pit east wall failure and remediation
E.I. Salas and G.K. Macqueen, Grange Resources, Australia

Slope Stabilisation – Case Study of a 70° weathered sandstone slope along the railway section between Deining and Batzhausen in Germany
B. Schoevaerts and C. Balg, Geobrugg Southern Africa (Pty) Ltd and Geobrugg AG, South Africa

Towards expediting large scale slope design using a re-worked design chart as derived from limit equilibrium methods
G. Kotze and K. Bosman, Open House Management Solutions Pty Ltd, South Africa

Risk Based Evaluation for Ore Recovery after a Major Slope Wall Failure

Stability considerations for slopes excavated in fine hard soils/soft rocks in the operative mine of Cobre Las Cruces, Sevilla, Spain
S. Cooper, M.D. Rodriguez, and V. Pozo, Cobre Las Cruces-FIRST QUANTUM, Subterra Ingeniería
Geotechnical considerations for the evaluation of the stability of cohesive rock derived residues at Cobre Las Cruces mine, Sevilla, Spain
M.D. Rodriguez, S. Cooper, V. Pozo, and J.M. Galera, Cobre Las Cruces-FIRST QUANTUM, Subterra Ingenieria

Runout of Open Pit Slope Failures
J. Whittall, E. Eberhardt, and O. Hungr, University of British Columbia, Vancouver, Canada

Probabilistic Assessment of Planar and Wedge Failure Modes

Verification of catch berm effectiveness through the application of 3D fall body dynamics
J.D. Bosman, Open House Management Solutions (Pty) Ltd, South Africa

Comparing traditional and televiewer methods of structural data collection: Case studies
K. Llewelyn, A. McCracken, M. Brown, and N. Marshall, SRK, United Kingdom

Characterization of Rock Masses Dominated by Healed Defects for Improving Slope Design Angles
C. MacCallum, R.P. Bewick, and L. Castro, Golder Associates Ltd, Canada

Damage in large open pit and high mountain slopes: The importance of simulating the correct unloading/excavation stress path
L. Zorzi, D. Elmo, and D. Stead, Golder Associates Ltd, Institute of Mining Engineering, Institute of Mining Engineering, Canada

Unified Rock Mass Classification Systems: A smart databasing tool
B. Westgate, R. Kettle, and N. Marshall, SRK, United Kingdom

Pit Wall Failure Prediction Methods and a Justification for Slope Monitoring
W. Newcomen and G. Dick, BGC Engineering Inc., Canada

Management of a Toppling Failure Wall Collapse at the Kamtanno Copper Mine in South Australia
B.J. Hutchison and S. Naude, Hillgrove Resources Ltd, IDS Australia, Australia

Kamtanno Mine - Rockfall and Rock Wall Failures - i-Site 8820 Laser Scanning Applications
B.J. Hutchison and J. Howarth, Hillgrove Resources Ltd, Australia

The Use of Rockfall Statistics in Managing Small Rockfalls in Two Australian Open Pit Mines
B.J. Hutchison, J. Chambers, G. Macqueen, and E. Salas, Hillgrove Resources Ltd, Grange Resources, Australia

3D geotechnical block model for pit slope stability – challenges and opportunities
K. Esmaieli and H. Eivazy, Lassonde Institute of Mining, University of Toronto, Canada

Implementing Probabilistic Designs at Anglo American Coal Open Cut Mines
A. McQuillan, G. Makusha, and I. Canbulat, Anglo American Coal, University of New South Wales, South Africa and Australia

Evaluation of rock bridging through DFN models to improve pit slope design in the absence of joint persistence data
S. D’Ambra, L. Castro, and R. Woodward, Golder Associates Ltd, Vancouver (BC), Golder Associates Ltd, Mississauga (ON), Dominion Diamond Corp., Canada

Geomechanical and operational considerations in the transition from single bench to double bench in Donose phase 1 Los Bronces operation Anglo American Chile
M.M. Schellman and D.C. Diaz, Anglo American Chile, Anglo American Sur., Chile

Influence of collecting additional data on the slope design in open pit mines
M.H. Fillion and J. Hadjigeorgiou, University of Toronto, Canada

Integrating Unconventional Techniques to Improve Data Confidence and Justify Slope Steepening at the Victor Mine
M. Rougier, M. Ruest, P. Gauthier, and A. Horwitz, Golder Associates Limited, Mississauga, University of Queensland, DeBeers Canada, Canada, Australia

Numerical Modelling of Faults and Resultant Stress Heterogeneity and Damage during Large Open Pit Mining
J. Severin, SRK, Canada

Spatial and Temporal Development of Stress Heterogeneity and Damage near Geologic Structures during Large Open Pit Mining
J. Severin, SRK, Canada

Rio Tinto Iron Ore’s Geotechnical Management System for Multi Operation Multi Pit
P.J.H. de Graaf and S.D.N. Wessels, Rio Tinto, Australia

Geotechnical Challenges in Development of El Soldado Open Pit
E.G. Bermedo and A.S. Cordova, Anglo American, Chile

Rockfall Catchment Investigations for the Upper West Wall of the Valley Pit
G. Gonzaga, N. Rose, and M. Veillette, Piteau Associates, Teck Highland Valley Copper Partnership, Canada

Advanced 3D visualisation and modelling techniques as applied to an integrated slope stability monitoring solution
J. Gray, Trimble, Germany

Slope instability in the public realm – A motivation for systematic geotechnical data collection and reporting to facilitate sharing of lessons learned
C. Zermatten and P.J. Terbrugge, SRK Consulting Pty Ltd, South Africa

C. Silwambaand and P.R.K. Chileshe, Copperbelt University, Zambia

A case study of particle flow modelling to estimate rock mass strength using the synthetic rock mass (SRM) approach
A. Huaman and E. Hormazabal, SRK Consulting Chile, Chile

Controlled damage – unfolding the design, risk and cost
S. Etchells, AEL, South Africa
Applying unsaturated soil mechanics principals to assess the stability of large open pit slopes developed in overburden materials in the Pilbara, Australia
K.G. Mercer and H. Rahardjo, Australian Centre of Geomechanics, Nanyang Technological University, Australia, Singapore

Geotechnical Investigation for Slope Failure Remediation: A case study
S.Z. Ndlovu, SRK Consulting Pty Ltd, South Africa

A Structural Geology Matrix for Geotechnical Design in Hard Rock
R. Campbell, Dr. W. Barnett, and M. Levy, SRK Consulting Pty Ltd, Canada

Application of ANOVA and Tuckey-Cramer statistical analysis to test the similarity of rock mass strength properties across the banded Iron formations of the Pilbara region in Western Australia
A. Maldonado and A. Haile, BHP Billiton, Australia

Open Pit 3-D Limit Equilibrium Numerical Modeling of Complex GeoStructures
T. Myhre and M. Fredlund, SoilVision Systems Ltd, Canada

The numerical simulation of anisotropic rock mass shear strength in Hamersley rock formations of the Pilbara using ABAQUS
K.G. Mercer, Australian Centre of Geomechanics, Australia

Rock Mass Characterization Using Non-Direct Measures of Graphite Content and their Relationship to Shear Strength (in the Selwyn Basin, Yukon, Canada)
M. Clark, J. Nava, A. Bloem, and J. De Bruyckere, SRK Consulting (Canada) Inc., University of British Columbia, Selwyn Chihong Mining Limited, Canada

An investigation into the shear strength of bedding planes in shale materials from the Hamersley group rocks of the Pilbara region in Western Australia
A. Maldonado, K. Mercer, and A. Haile, Australian Centre of Geomechanics, Canada

The Hydro-mechanical coupling Package: A new MODFLOW package to permit the simulation of pore pressure reduction as a result of lithostatic unloading in open pit mining
A. Black, M. Raynor, W. Gibson, and S. Pandy, SRK UK Ltd, United Kingdom

The transient design and optimisation of a groundwater control scheme for the Hinda Phosphate Mine in the Republic of Congo
A. Black, W. Harding, S. Johnson, C. Turvey, T. Jarman, and R. Smith, SRK UK Ltd, United Kingdom

Mining in Weak Mudrock - Voorspoed Mine
J. Ekkerd, P. Tsheko, and M. Ruest, De Beers Consolidated Mines, Voorspoed Mine, University of Queensland, South Africa and Australia

Saprolite Slope Design at the Rosebel Gold Mine
G. Abrahams, M. Raynor, and K. Mandisodza, SRK Consulting, Canada, SRK Consulting, UK, IAMGOLD, Canada, United Kingdom

Slope stability studies in the North wall of the Nyabirama open pit for the future cut backs
A. Kabinda, ACACIA Mining Plc

Cerro Vanguardia open pit mining: analytical and numerical methods for stability verification
I.G. Mendive and A. Sríso, SRK Consulting Argentina, Argentina

Observed pore pressure responses and conceptual groundwater models from an operational open pit mine in a tropical high rainfall environment – A case study from Rosebel Gold Mine, Surinam
M. Raynor, J. Adams, and C. Rambharos, SRK Consulting, UK, SRK Consulting, Canada, IAMGOLD, Hema Ramlakhan, United Kingdom, Canada

A review of modeling approaches and codes for pore pressure simulation in a tropical high rainfall environment
E. Helmers, M. Raynor, G. Abrahams, and R. Tunney, SRK Consulting, Canada, SRK Consulting, UK, IAMGOLD, Canada, United Kingdom

Establishing Geotechnical Standards across KGHM Mines in North and South America
S. Kluck, Robinson Holdings (USA) Ltd, USA

A comparison of stress-deformation modeling and limit equilibrium approaches for evaluating the stability of large rock slopes
K.M. Moffitt and H. Puebla, Golder Associates, USA

Incorporating the influence of structure in continuum approaches to slope stability
K.M. Moffitt, S.A. Otto, and J. Graaf, Golder Associates, USA, Australia

Steep Slope Designs to manage Overbank hazard due to Pushbacks in hard rock, Mine Tio open pit, Quebec
M. Rougier, J. Legare, J. Berge, and P. Gince, Golder Associates Limited, Rio Tinto Fer et Titane, Canada

Management of slopes at Rössing Uranium Limited
G. Ockhuizen, Rio Tinto, South Africa

Opencast slope stability analysis above previously underground mined coal seams
D. Olivier, SRK, South Africa

Waste rock dump management and stability evaluation
D. Olivier, SRK, South Africa

Factors affecting rock stability
M.I. Biya, University of Johannesburg, South Africa