

# Table of Contents

- iii Australian Centre for Geomechanics
- v Technical Reviewers
- vii Preface

## KEYNOTE ADDRESSES

---

- 3 The expanding impact of technology on underground geomechanical mine design and operations — advances, limitations and future needs  
*WF Bawden, Mine Design Engineering, Canada*
- 21 Dugald River case study — the importance of understanding your orebody and designing your mine for maximum value  
*P Harris, MMG Limited, Australia*
- 37 Empirical design methods in practice  
*R Pakalnis, Pakalnis & Associates and the University of British Columbia, Canada*
- 57 Rock engineering design — the importance of process, prediction of behaviour, choice of design criteria, review and consideration of risk  
*TR Stacey, University of the Witwatersrand, South Africa*

## NUMERICAL MODELLING

---

- 79 Discrete analysis of open stope stability  
*B Sainsbury, Monash University, Australia; D Sainsbury, A Vakili, Mining One Pty Ltd, Australia*
- 95 Room and pillar stability analysis using linear elastic modelling and probability of failure — a case study  
*EJ Walls, P Mpunzi, WC Joughin, SRK Consulting (SA) (Pty) Ltd, South Africa*
- 107 Defining the role of elastic modelling in underground mine design  
*BJ Barsanti, Newmont Asia Pacific, Australia; FRP Basson, Newmont Asia Pacific, Australia*

## DESIGNING FOR SEISMICITY

---

- 123 Seismic hazard assessment using apparent stress ratio  
*LG Brown, MR Hudyma, Laurentian University, Canada; P Turcotte, Agnico Eagle Mines Limited, Canada*
- 135 Design and management processes involved with extracting regional pillar stopes in a seismic setting at Darlot Gold Mine  
*C Moulding, P Andrews, Gold Fields Australia Pty Ltd, Australia*
- 149 Study of stress conditions at Williams Mine using underground observations and microseismic monitoring data  
*PJ Earl, Global Mine Design Ltd, UK; D Malovichko, Institute of Mine Seismology, Australia; D Rebuli, Institute of Mine Seismology, Canada*

## OPTIMISATION OF DESIGN

---

- 167 Geotechnical design considerations for Dugald River — from slot to sequence  
*R de Vries, R Hassell, MMG Limited, Australia; J Player, MineGeoTech, Australia*
- 185 Dugald River trial stoping, overall hanging wall behaviour  
*R Hassell, R de Vries, MMG Limited, Australia; J Player, MineGeoTech, Australia; A Rajapakse, MMG Limited, Australia*
- 199 Short-term solutions to squeezing ground at Agnew Gold Mine, Western Australia  
*CE Woolley, P Andrews, Gold Fields Australia Pty Ltd, Australia*

- 215 Geotechnical approach to stope and pillar optimisation at Granny Smith Mine  
*L Machuca, M Sutton, R Grow, P Andrews, Gold Fields Australia Pty Ltd, Australia*
- 233 Establishing geotechnical processes for improved mine design at Bulyanhulu  
*RM Stephenson, AMC Consultants Pty Ltd, Australia; GC Chilala, R Harris, Acacia Mining plc, Tanzania; O Watson, AMC Consultants Pty Ltd, Australia*
- 241 Initial effects of improved drill and blast practices on stope stability at Acacia's Bulyanhulu Mine  
*GC Chilala, J de Assuncao, R Harris, Acacia Mining plc, Tanzania; RM Stephenson, AMC Consultants, Australia*

---

## PILLAR DESIGN

---

- 257 Pillar design around mullock-filled stopes in the 3500 Orebody, Mount Isa Mines  
*D Matthews, Glencore Mount Isa Mines, Australia*
- 273 Work conducted in preparation for partial extraction of X41 shaft pillar at Mount Isa Mines  
*GS Potgieter, Glencore Mount Isa Mines, Australia*

---

## DESIGN IN NARROW VEIN MINING

---

- 293 Design and application of an efficient mining method for gentle-dipping narrow vein at Kafang Mine  
*F Gao, KP Zhou, HW Deng, NG Yang, JL Li, Central South University, China*
- 307 Suitability of the overhand cut-and-fill mining method for narrow vein graphite extraction — a case study  
*K Ekanayake, C Ekanayake, Bogala Graphite Lanka PLC, Sri Lanka*

---

## INPUT DATA FOR DESIGN

---

- 317 Unravelling structural fabric — a necessity for realistic rock mass characterisation for deep mine design  
*TG Carter, SF Rogers, JLL Taylor, J Smith, Golder Associates Ltd., Canada*
- 339 Contribution to drift design using discrete fracture network modelling at the Éléonore Mine in Canada  
*M Grenon, A Landry, Laval University, Canada; J Hadjigeorgiou, University of Toronto, Canada; PL Lajoie, Goldcorp Inc., Canada*
- 351 Statistical characterisation of intact rock properties at a Canadian underground mining project  
*M Grenon, C Boudreau, G Bruneau, Laval University, Canada; R Caumartin, Glencore Raglan Mine, Canada*
- 367 How reliable are your design inputs?  
*MJ Dunn, Evolution Mining Ltd, Australia*

---

## GROUND SUPPORT

---

- 385 Empirical ground support and reinforcement design at Challenger Gold Mine  
*PB Hills, pitt&sherry, Australia; N Raymond, M Doyle, Challenger Gold Mine, Australia*
- 399 Evaluation of the adjusted rockburst damage potential method for dynamic ground support selection in extreme rockburst conditions  
*W Duan, The University of Western Australia, Australia; J Wesseloo, Y Potvin, Australian Centre for Geomechanics, The University of Western Australia, Australia*
- 419 Empirical ground support design of mine drives  
*Y Potvin, Australian Centre for Geomechanics, The University of Western Australia, Australia; J Hadjigeorgiou, University of Toronto, Canada*

## PLANNING, DESIGN, PRODUCTION AND FINANCIAL INPUT

---

- 433 Mine design impact on operating and capital costs  
*D Morrison, R Webb, A Akerman, H Parsons, Centre for Excellence in Mining Innovation, Canada*
- 443 Discrete event simulation — a tool to support the design of complex production and logistic processes; its application in underground mine design  
*K Quan, G King, T Schrimpf, Amec Foster Wheeler, Australia*
- 463 Cost estimates as a design tool — the impact of mine design on ventilation costs for a variety of underground mining scenarios  
*S Stebbins, Aventurine Mine Cost Engineering, Inc., USA*

## PLANNING AND GEOTECHNICAL DESIGN

---

- 477 Development of an integrated platform for stability analysis and design in sublevel stoping mines — MineRoc®  
*JA Vallejos, O Miranda, C Gary, A Delonca, University of Chile, Chile*
- 489 Design approach for squeezing ground  
*RP Varden, MineGeoTech, Australia; MJ Woods, BHP Billiton, Australia*
- 505 Practical long-term planning in narrow vein mines — a case study  
*MM Khani, Mandalay Resources Costerfield Operations, Australia*

## DILUTION CONTROL

---

- 515 Simulate waste rock flow during co-disposal for dilution control  
*FRP Basson, NJ Dalton, BJ Barsanti, AL Flemmer, Newmont Asia Pacific, Australia*
- 527 A methodology for predicting dilution of cemented paste backfill  
*RL Veenstra, Glencore Mount Isa Mines, Australia*
- 541 A dilution model for narrow vein mine design — a case study  
*F Marco, JA Vallejos, R Castro, A Hekmat, University of Chile, Chile*
- 553 Ore dilution control practised at Sindesar Khurd Mine of Hindustan Zinc Ltd  
*S Dutta, A Lal, V Chittora, L Chordia, D Taylor, Hindustan Zinc Ltd, India*

## OREPASS DESIGN

---

- 571 Input to orepass design — a numerical modelling study  
*J Sjöberg, A Bolin, Itasca Consultants AB, Sweden; A Sánchez Juncal, University of Alberta, Canada; T Wettainen, LKAB, Sweden; D Mas Ivars, F Perman, Itasca Consultants AB, Sweden*
- 585 Guidelines for orepass design in a sublevel cave mine  
*KA Bunker, AD Campbell, Ernest Henry Mining, Australia; D O'Toole, pitt&sherry, Australia; A Penney, AMC Consultants Pty Ltd, Australia*
- 601 Author Index