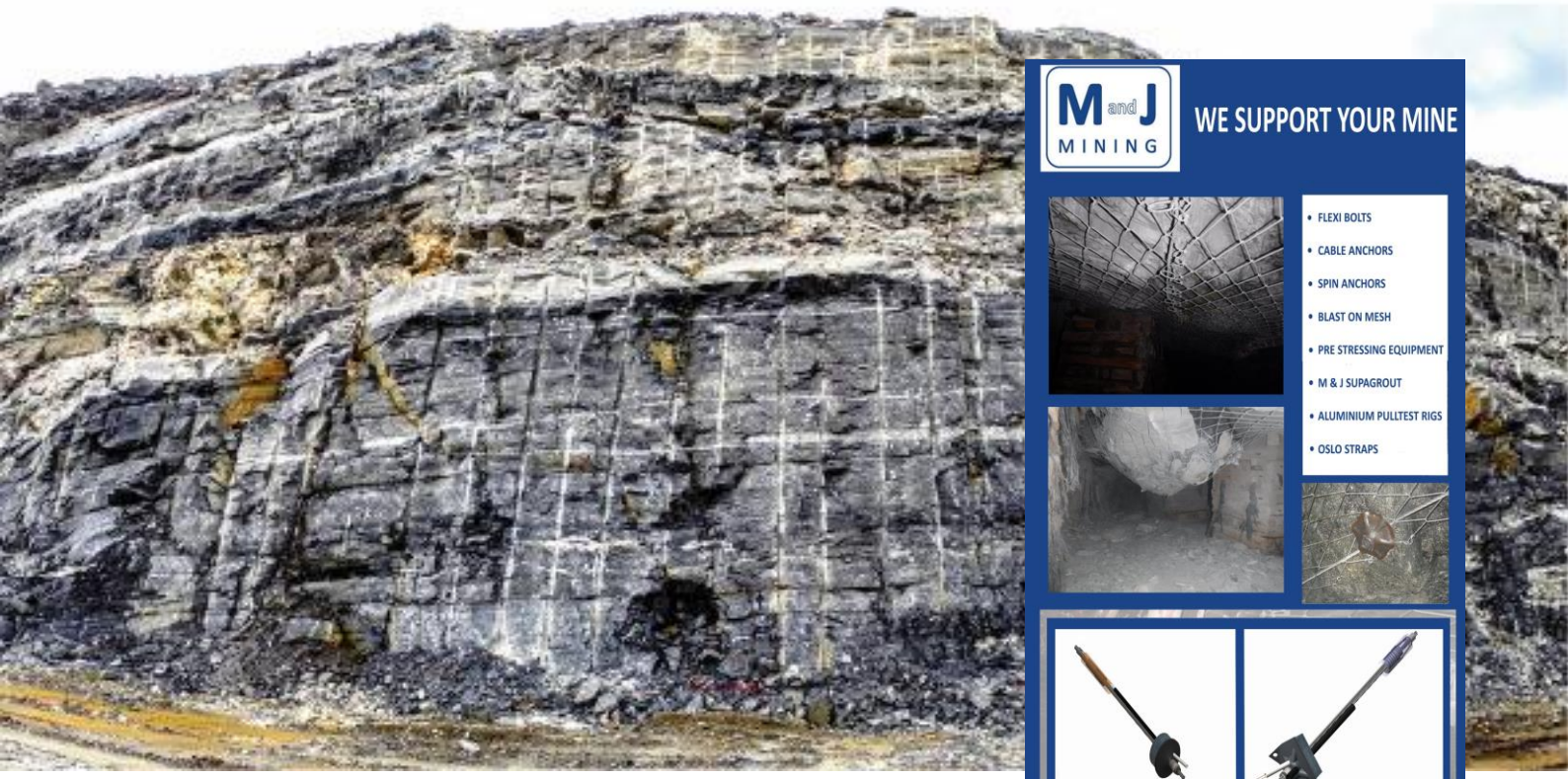
SANIRE
SOUTH AFRICAN NATIONAL INSTITUTE OF ROCK ENGINEERING

ROCK talk

Volume 9, Issue 1 | April 2023



PRESIDENT'S CORNER

Dear SANIRE member,

This year began with great anticipation as the mining industry saw a 70% year-on-year reduction in fall of ground fatalities in 2022. The number decreased from 20 fatalities in 2021 to 6 in 2022. There have been a lot of discussion of how this was made possible through engineered solutions, enabling environments, leadership, safety culture, and collaboration between all stakeholders, to name a few. This is a step in the right direction, but we still have not achieved zero fatalities.

WHAT'S INSIDE

- President's Corner
- SANIRE Symposium
- SANIRE Branches Council Tour
- Fall of Ground Management
- SANIRE Awards
- SANIRE RockStar

PRESIDENT'S CORNER

Sadly, we have not had a good start in Q1 of 2023, as the mining industry have already reported 6 FOG related fatalities. This is more than half of what was achieved last year. This may cast doubt on last years achievement and with three quarters to go, there will be a lot of effort required to ensure we do not have any more FOG fatals.

I urge all of us in the rock engineering profession to collaborate, share learnings to prevent repeat incidents, actively participate in industry events such as the MINCOSA Day of Learnings, COPA's, FOGAP and motivate to implement the leading rock engineering practices at your operations.

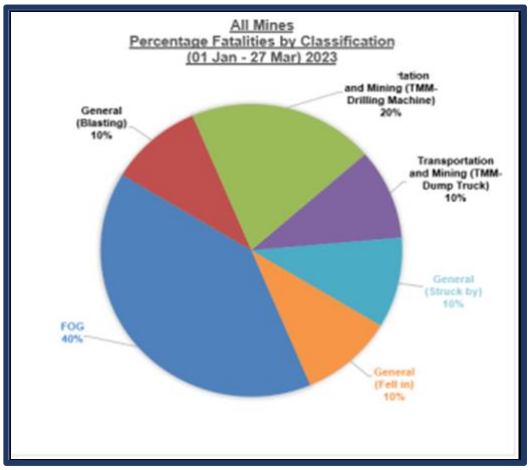


Figure: DMRE weekly report

I look forward to our SANIRE Symposium on 21 and 22 June 2023 with the theme: "Turning Challenges into Opportunities" which talks a lot to the challenges we currently experience as an industry. The event will be again hybrid to reach those who are far and cannot personally attend. This invitation is open to everyone to participate to make it an even bigger success than last year.

Lastly, I want to wish all the candidate's and examiners good luck with the upcoming theory and practical examinations.

SANIRE greetings,

Lizelle Prinsloo
SANIRE President

SANIRE SYMPOSIUM 2023

Book your diaries for the exciting South African National Institute of Rock Engineering (SANIRE)
Turning Challenges Into Opportunities Symposium.
The Hybrid Symposium will take place on the **22nd & 23nd June 2023 at Emperors Palace Conference Centre.**
Note that the SANIRE website will have more information and registration.

The South African National Institute of Rock Engineering

is announcing the

SANIRE Symposium 2023

TURNING CHALLENGES INTO OPPORTUNITIES

You and your colleagues are invited to this unique event to reunite with the industry partners to reflect on how rock mechanics have evolved and exchanging new ideas and exploring the future in this field.

JOIN US AS A SPONSOR!

We offer several kinds of sponsorship possibilities in SANIRE SYMPOSIUM 2023. This is a great opportunity to have visibility and showcase your company or organization and your contribution to the rock mechanics industry.

SANIRE
SOUTH AFRICAN NATIONAL INSTITUTE OF ROCK ENGINEERING

SANIRE SYMPOSIUM 2023
22 - 23 JUNE

TURNING CHALLENGES INTO OPPORTUNITIES

EMPERORS PALACE CONFERENCE CENTRE
KEMPTON PARK

WE ARE CALLING FOR PRESENTATIONS

The South African National Institute of Rock Engineering is calling form presentations to the SANIRE Symposium 2023. We want learn how you, your company, research or new innovation has turned a rock engineering challenge into a rock engineering opportunity.

In an effort to respond to ideas coming from SANIRE members the 2023 Symposium will feature an opportunity for expanded participation in the programme through presentations. The aim of the Symposium is to broaden participation and learning by opening an opportunity for innovative and challenging material that would not otherwise be available in other formats. The Symposium will be held from the 22nd to 23rd June 2023 at Emperors Palace Conference Centre, Kempton Park. Interested practitioners, researchers, managers and others in the field of Rock Engineering can create meaningful dialogues by sharing their knowledge through presentations during the Symposium.

SANIRE appreciates all submissions in Rock Engineering, with particular emphasis on:
- Research and Development
- Innovation
- Rock Engineering Techniques
- Interesting Case Studies
- Best practice learnings

KEY DATES:

Submission Deadline: 19 May 2023
Notification of Acceptance: 2 June 2023

Each presentation abstract will be reviewed by at least three members of the SANIRE Council and reviewed based on a range of parameters. Presentations will be competitively evaluated using:
- Technical soundness
- Innovation in topic and approach
- Creative and compelling content
- Effective use of case studies and literature

NOTE:

Presentations that are not Rock Engineering related or are sales pitches for products or services will not be considered, unless otherwise agreed to by SANIRE Council as a sponsorship package.

SUBMISSIONS CAN BE MADE TO:

Mbalenhle Buthelezi Tel: 011 568 2054
Email:mbalenhleb@mpas.org.za

On behalf of the SANIRE President and Council, we look forward to receiving your abstracts.

Sincerely,
Lizelle Prinsloo
SANIRE President

SANIRE
SOUTH AFRICAN NATIONAL INSTITUTE OF ROCK ENGINEERING

SANIRE SYMPOSIUM 2023
22 - 23 JUNE

TURNING CHALLENGES INTO OPPORTUNITIES

EMPERORS PALACE CONFERENCE CENTRE
KEMPTON PARK

WE ARE CALLING FOR EVENT SPONSORSHIP

Dear Sir / Madam

The South African National Institute of Rock Engineering Symposium is a forum for Rock Engineering Practitioners to showcase their technical abilities and skills to the industry over a period of two days. Participants and Presenters network, share ideas, knowledge and practices, whilst learning more about the most recent innovations, trends, experiences and concerns in Rock Engineering. In an effort to respond to ideas coming from SANIRE members the 2023 Symposium will feature an opportunity for expanded participation in the programme through presentations. The aim of the Symposium is to broaden participation and learning by opening an opportunity for innovative and challenging material that would not otherwise be available in other formats. The Symposium will be held from the 22nd to 23rd of June 2023 at Emperors Palace Conference Centre, Kempton Park, Johannesburg. Interested practitioners, researchers, managers and others in the field of Rock Engineering can create meaningful dialogues by sharing their knowledge through presentations during the Symposium.

I am writing this letter to invite you to be a Co-Sponsor and or support this event. As a leader in the industry, your involvement with us in the SANIRE Symposium is an opportunity for your organization to receive exposure and to join other individuals, organisations, and coalitions in our association to educate Rock Engineers on current topical issues within the industry. The theme for the SANIRE Symposium is "**Turning Challenges into Opportunities**"

EXHIBITORS

GOLD PACKAGE
PLATINUM PACKAGE
SILVER PACKAGE
PRESIDENTIAL DINNER
ROCKBOWL

We look forward to hearing from you.

For more information about this event, please contact:
Mbalenhle Buthelezi
Tel: 011 568 2054
Email:mbalenhleb@mpas.org.za

On behalf of the SANIRE President and Council, we thank you for your support.

Sincerely,
Lizelle Prinsloo
SANIRE President

SANIRE
SOUTH AFRICAN NATIONAL INSTITUTE OF ROCK ENGINEERING

ROCKBOWL 2023

DATE: 22 JUNE 2023
VENUE: HYBRID EVENT: VIRTUAL, OR EMPERORS PALACE CONFERENCE CENTRE
TIME: 15H00 - 17H00
CLOSING DATE FOR ENTRIES: 31 MAY 2023

WHAT IS ROCKBOWL?

A game of questions & answers in which **teams are challenged** to **answer** technical & non-technical **questions** about rock engineering.

T'S & C'S

Maximum 4 participants per team
All participants to be SANIRE members

WHO SHOULD ATTEND?

Anyone interested in rock engineering looking to brush up their social skills....
Only joking!
All ages welcome.

WHAT'S UP FOR GRABS?

Bragging rights
A host of fantastic prizes

DO NOT MISS OUT!

This year the RockBowl will be HYBRID and teams can participate virtually or face to face at EMPERORS PALACE CONFERENCE CENTRE. Teams in attendance must be registered for the Symposium. This is a great opportunity for you and your team to showcase and test your knowledge against the best and brightest in the field of rock engineering. **Register your team today** and stand a chance to become the **2023 SANIRE RockBowl champion**.

WAIT, THERE'S MORE!

A team of 3 participants will be selected from the participants to represent SANIRE at the ISRM RockBowl 2023 in Austria - fully sponsored by SANIRE. The criteria for this will be communicated soon.

HOW TO ENTER?

Complete the entry form with your team name as well as the names and ages of each participant.

REGISTER NOW

SANIRE BRANCHES
COUNCIL TOUR, NORTHERN CAPE BRANCH

The very first SANIRE council tour to the Northern Cape brunch was a great success. The new branch committee for NC was elected during the visit. The council also conducted a technical visit at Kumani iron ore mine.

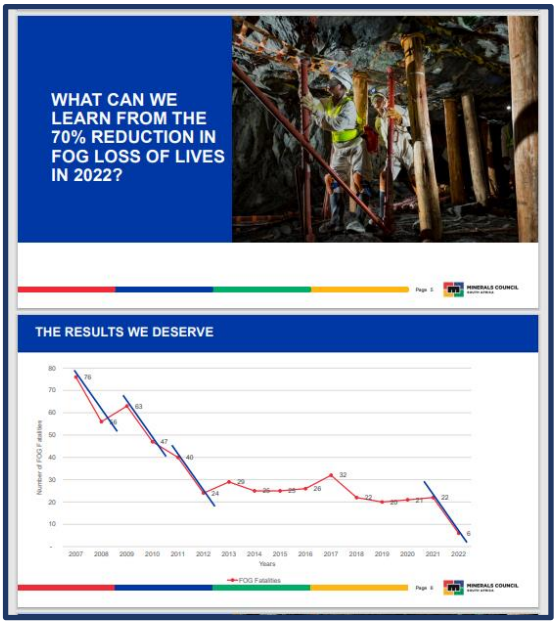
From left to right:
Vice Chair: Gerald Gainsford
Supplier representative: Daniel Blom
Chairperson: Billy Mashiatshiti
Treasurer: Radifadi Mamabolo
Young Member Representative: Naledi Letlape
Secretary: Jeevan John

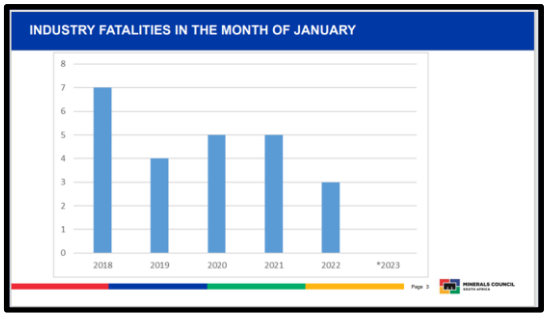
WESTERN BUSHVELD BRANCH GOLF DAY

The Western Bushveld Branch meeting golf day was a success. The rain almost ruined the event but all went well. The professional photographer at the event has captured the memorable event.

FALL OF GROUND MANAGEMENT

The fall of ground has seen a downwards trend from the year 2021, with a life time achievement of the very first January with no FOG fatal in 2023. Well done to gate keepers of FOG in the mining industry.





TUNNEL BORING IN MINING AND CIVIL ENGINEERING

This year's biennial symposium of the South African National Committee on Tunnelling (SANCOT) was hosted in November in the university town of Stellenbosch at the Wallenberg Conference Centre @STIAS (Stellenbosch Institute for Advanced Study). Needless to say, the setting in itself presented its own attraction, and soon enough we'll have new tunnelling developments in the region to draw a second occasion!

There is yet another, more specific reason to couple the beauty of the Western Cape winelands, and the richly concentrated resources of a world class university and research instution to that of exploring tunnelling advancements. Aside from the obvious burgeoning and burning need for urban infrastructure development, this is additionally juxtaposed on that of global consciousness on sustainable development and protection of the environment. Sustainable solutions to the exploding problems associated with those indelible effects of our human footprint on this precious planet mean that not only are we bound to seek short-term results to accommodate ourselves, but an imperative to find long-term results that future generations can live with.

At the risk of expanding on a cliché, it is through tunnelling that this will be achieved – is already being achieved, and has been largely entrenched into urban development strategies globally. Underground infrastructure development provides a means through which we foresee a lasting offset to environmental impacts as a result of urbanisation. And for the Sub-Saharan region, this SANCOT symposium held special significance. In the near future, water shortages, roads, rail, urban networks, access to raw materials through mining, the establishment of storage facilities to hold grain, for underground cultivation or waste disposal, will become imperative to accommodate the approximately 2.5 billion people projected to occupy the African continent by 2050, less than 30 years from now.

The theme of the conference 'Tunnel boring in civil engineering & mining' therefore spoke directly to these challenges. The pressure not only to deliver the results, but to do so safely, fast and effiiciently informs those technological advancements so desperately required.

Many tens of thousands of kilometres of underground tunnels have historically been developed, by conventional drill and blast methods, but this is changing; slowly, but ever more steadily and rapidly, as technological advances for mechanised tunnelling and tunnel boring in mining are gaining traction – literally and strategically.

The SANCOT 2022 Symposium was attended by a selection of globally representative delegates from Europe and the Americas, as well as a significant contingent of South African delegates.

Microtunnelling in Cape Town
Photo courtesy: Du Toit Carstens et al, WSP Group Africa, CSV Construction and City of Cape Town

Symposium presentations, in keeping with the conference theme, included:

- Microtunnel boring in the Cape Town Metropolitan;
- Design and construction considerations for the Lesotho Highlands Water Project Phase 2 diversion and transfer tunnels;
- Challenges and trends with the excavation of long tunnels using tunnel boring machines (TBM);
- Use of special ground support and reinforcement;
- Navigating adverse ground conditions, ground characterisation and reinforcement;
- Novel tunnel boring projects in mining;
- Hydropower; and
- Technical visit: Huguenot North Bore Tunnel

For more information, see: https://www.saimm.co.za/media/com_eventbooking/SANCOT%20Symposium%20Final%20Programme-19102022.pdf) (*select images and snapshots from presentations included herein*)

The SANCOT group, as well as its parent body, the ITA (i.e. International Tunnelling Association), provides that unique meeting point to bring together the benefits of experience and resources from both the civil and mining engineering sectors. Our aim as SANCOT is to continue to provide a forum where technological advances in tunnelling are shared and discussed, thereby facilitating the development of skills and resources in support of safe tunnelling best practices, in South Africa, Sub-Saharan Africa, and the African continent.

Drill and Blast tunnel viz. with Mobile Tunnel Bored tunnel
Photo courtesy: Anglo American – Carstens and Van Rooyen

Huguenot North Bore Technical Visit
Photo courtesy: SANCOT Committee

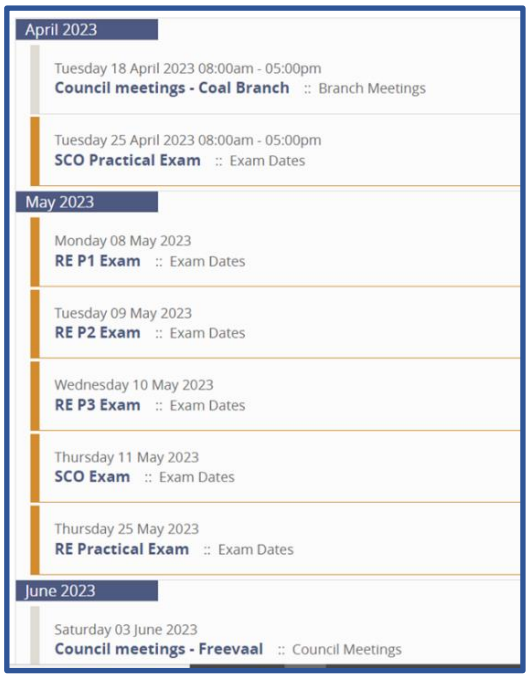
Information on SANCOT and its activities can be found at the SAIMM site page here: https://www.saimm.co.za/about-saimm/saimm-committees/south-african-national-council-on-tunnelling-sancot

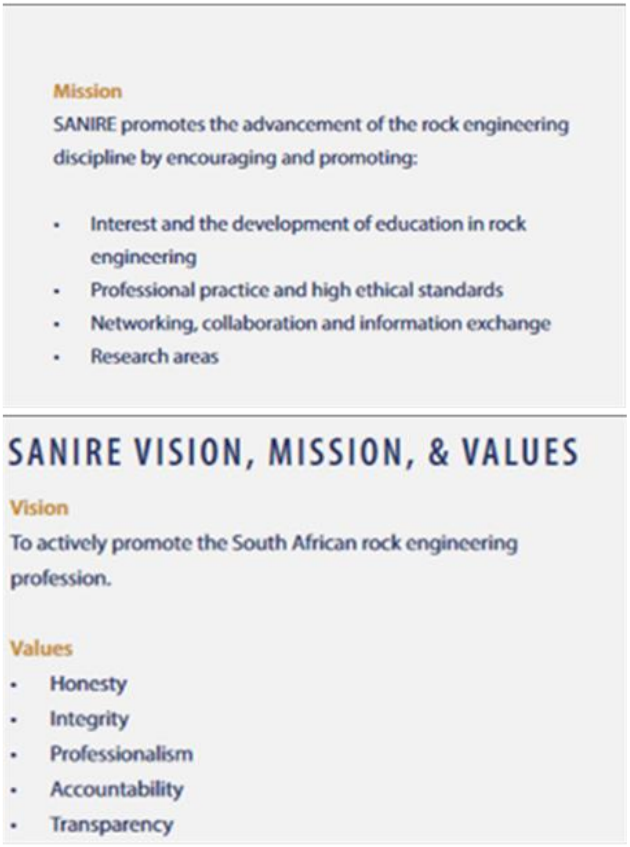
Information on ITA and its activities can be found here: https://www.ita-aites.org/
The lunchtime series on sustainability and carbon neutral underground can be found here: https://www.itacet.org/

Jeanne Walls: Vice Chair, SANCOT

SANIRE CALENDER

Visist https://www.sanire.co.za/news/events-calendar for unpdated upcomming evenets.





Name	Surname	Email	Branch
Louis	Lochner	Louis.lochner@Harmony.co.za	Free Vaal Branch
Ross	van Heerden	Ross.vanHeerden@Harmony.co.za	Gauteng Branch
Gunther	Betz	Gunther.Betz@norplats.co.za	Eastern Bushveld Branch
Billy	Mashiatshiti	billy.mashiatshiti@angloamerican.com	Northern Cape Chairperson
Hlomani	Mthombeni	Hlomani.Mthombeni@sibanyestillwater.com	Western Bushveld
Nyandano	Netshivhazwaulu	Nyandano.netshivhazwaulu@seritiza.com	Coal Fields


INSTOPE LIGHTING
SAFELIGHT
LIGHT THE WAY
QUALI ROCK
MONITORING
Contact:
Christiaan: 082 8989 834
Nolene: 082 3184 828
www.safelight.co.za
Proud recipient of the SANIRE Lelanie Prinsloo Technological Innovation Award 2022

ROCK STAR OF THE QUARTER

Full Name: Fikile Marvin Mokgethoa

Company/Organisation: Anglo American Kumba Iron Ore, Kolomela

Designation: Geotechnical Engineer

Date and Place of Birth: 29 October 1995, born in Marble Hall and bred in Siyabuswa

Education: BSc Mining Engineering (Wits), RMC (Open Pit), MSc Rock Engineering candidate (Wits)

First Job: Mine Survey Tutor (To 3rd-year students)

Philosophy of Life: Amid chaos, there is also opportunity

Favourite Food/Drink: A good wagyu steak is where it's at. I also enjoy South African cuisine

Favourite Sport: I have a lot to choose from, but it has to be football. My dream is to watch Lionel Messi play live before retirement Lost opportunity at the 2022 FIFA World Cup Final☹).

Q. What motivates you to get out of bed in the morning?

Life problems. I don't have to set my alarm anymore, ziyakhala bafwethu 😊

Q. What is your favorite quote (why)?

"At any given point, you're 55 minutes away from load shedding" – Maya Angelou. Lol

On a serious note:

"Finding beauty within the imperfections of life and accepting the natural cycle of growth and decay" - Wabi-sabi (侘寂)

Embrace imperfection. Nothing lasts, nothing is complete. Accept your own flaws and those of others. Find beauty in imperfection.

Q. What is your personal song (why)?

The question is restrictive. I am a music fanatic, I listen to almost all genres. No one song is enough to be a "personal" song. It all depends on the mood and the state of mind at the time.

Q. What is your favourite movie?

I struggle with maintaining attention for that long. I do well with series instead. ADHD?

Q. If the story of your life were to become a biopic, what would the title be?

"The Pursuit of Happiness"

Q. What is the best vacation you've been to or plan on going to?

Cape Town/Zanzibar. There is just something about the coast.

Q. Do you have a favourite newspaper, blog?

Twitter and browsing the internet can be very informative.

Q. What is your greatest fear?

Death of the people around me.

Q. What is your hidden talent?

I have a photographic memory.

Q. What's your most memorable facepalm moment?

Worth a thousand words

Q. If you could interview one person (dead or alive) who would that be (why)?

Myself. Why not?

Q. If you were an animal, what would you be (why)?

Silverback Gorilla. So powerful and majestic. It signifies strength and resilience.

Q. If you were on death row, what would your last meal be?

Table for one with Pap and eggs, please.

Q. If you were stuck on an island what three things would you bring?

A cellphone (with a lot of battery life), food and good company.

Q. If you were a rockstar, what would your stage name be?

"Fiks The Future", lol that's what some of my colleagues call me.

Q. Growing up, what was your dream career?

I have always wanted to be a veterinarian. I outgrew it.

Q. Why did you choose Rock Engineering as a career?

In university, I performed very well in Rock Mechanics and Rock Engineering and even completed a Rock Engineering project in 3rd-year. But following Rock Engineering was not on my plan. I wanted Mining Production. However, Rock Engineering presented itself in a form of an opportunity and I have never looked back. It is mentally stimulating and perfect for me. Cliché, but I guess you can say Rock Engineering chose me.

Q. What do you find the most challenging of Rock Engineering?

Developing an engineering solution to highly complex heterogeneous rock masses which are influenced by numerous parameters and variability.

Q. What do you like most about Rock Engineering?

Rock Engineering fraternity is a relatively new field. So, there is a lot of room for groundbreaking research, innovation and meaningful contributions. I like the idea that in my development in the field, I might not be too far off from pioneering valuable aspects of Rock Engineering.

Q. What are some areas that you believe will become of increasing importance in the near future of the rock engineering discipline?

Rock Engineering is reaching untapped territories as we access deep-lying deposits. This creates a need for research and more intense data and risk-driven Rock Engineering strategies. The future is data and risk driven.

Q. What advice would you give to someone who want to choose Rock Engineering as career?

It can be interesting, satisfactory and rewarding when you have a passion for it. If you want to explore it, be prepared to be one of the coolest people in the mining industry.

Q. What is the best advice you have ever been given?

Smile through it, it is never that bad.

SANIRE
SOUTH AFRICAN NATIONAL INSTITUTE OF ROCK ENGINEERING

CALL FOR NOMINATIONS

NOMINATION CATEGORIES

- ✓ HONORARY FELLOWSHIP
- ✓ HONORARY MEMBERSHIP
- ✓ PRACTITIONER OF THE
- ✓ ROCKSTAR OF THE YEAR
- ✓ LELANIE PRINSLOO TECHNOLOGICAL INNOVATION
- ✓ DICK STACEY MASTERS THESIS

HONORARY FELLOWSHIP(Lifetime Achievement Award)

It is awarded to individuals in a mature stage of their career (typically retired) with a long and distinguished track record in Rock Mechanics. Candidates should also preferably be associated with SANIRE. The nomination must be motivated by a SANIRE Member or Fellow for consideration by Council.

HONORARY MEMBERSHIP(Lifetime Achievement Award)

It is awarded to individuals in a mature stage of their career (typically retired) These individuals are recognized by their peers for their long term contribution to the Rock Engineering industry. Candidates should also preferably be associated with SANIRE. The nomination must be motivated by a SANIRE Member or Fellow for consideration.

PRACTITIONER OF THE YEAR

Should be Associate Members or Members of SANIRE. Candidates motivations should be done in writing detailing the individual's contributions. The nominations will be reviewed and approved by the Council members. Also, the achievements of the recipients of this award should be recognised by clients or peers.

ROCKSTAR OF THE YEAR

Candidates should be Associate Members or Members of SANIRE and must be 35 years of age or younger. Motivations should be done in writing detailing the individual's contributions. The nominations will be reviewed and approved by the Council members. Also, the achievements of the recipients of this award should be recognised by clients or peers.

DICK STACEY (NEW)

Will be awarded annually for an outstanding Masters thesis or dissertation in the field of Rock Mechanics Engineering. Typically one award will be given every year to a deserving individual, although at the discretion of the SANIRE Council.

LELANIE PRINSLOO (Technological Innovation) (NEW)

Will be awarded to a SANIRE affiliated South African manufacturing company or member who has made a significant contribution towards innovation or new research or development in Rock Engineering practice. Typically one award will be given every year to a deserving individual, although at the discretion of the SANIRE Council.

NOMINATIONS

SANIRE is seeking nominations for the 2023 awards. Award recipients will be honored at the SANIRE Banquet.

Nominations typically require a candidate's name, full contact information, biographical information, and/or history of service to the Association.

Some awards require additional nomination materials. For more information on how to nominate an individual, see each award page on the SANIRE Website.

VIST WEBSITE

Sandvik - digital convergence system for ground support

Sandvik is launching xCell Cyclops™, a convergence system for ground support in underground mining that provides wireless, continuous, remote, and real-time measurement of ground movements. It features built-in notifications and alarms to support a safer and more sustainable work environment.

Underground mining is generally trending deeper, which leads to more difficult and complex ground conditions for mine operators to manage. Squeezing ground and seismic events can have a major impact on both the safety and productivity of a mining operation. The new xCell Cyclops™ convergence system from Sandvik enables remote assessment of rock mass behaviour, which leads to safer, more efficient, and cost-effective ground support and optimized ground rehabilitation.

The retrofittable design of xCell Cyclops™ sensors makes them very easy to install directly onto existing rock bolts. They are battery-powered and operate with highly accurate laser measurements, and can be connected via both Wi-Fi and Bluetooth, providing operators with real-time access to data, built-in notifications, and alarms. This setup reduces the need for manual work and inspections in the mine, reducing costs and improving safety.

"The new xCell Cyclops™ convergence system is a major technological leap forward to achieve a safer, more sustainable way of digitally monitoring convergence in underground mining," said Peter Young, Product Manager for Bolting at Sandvik Mining and Rock Solutions' Ground Support Division. "Through the wireless and connected devices and a user-friendly online platform, customers can easily adapt their individual setup and track any changes in the mine's ground conditions."

The xCell Cyclops™ system is available today as a subscription service with three levels: "Basic," "Silver" and "Gold." Number of users at a site and devices in remote mode vary across the levels. Local service is included in all three levels, and remote service is included in the "Gold" package.

For more information contact: Rocbolt Technologies on sales@rocbolt.com

ROCBOLT TECHNOLOGIES

DSI UNDERGROUND

institute of mine seismology

33rd Mine Seismology Seminar

28 May – 2 June 2023, Asara Wine Estate, South Africa

Sunday 28 May 10h00 - 16h00	**Meeting of the International Research Advisory Board of the Institute of Mine Seismology**
Sunday, 18h00	Ice-Breaker including talk by Dr Gerrie van Aswegen on **History of Rockburst Studies in South Africa – a Personal Perspective**
Monday 29 May 09h00 - 18h00	**Mine Seismology Seminar Day1: Lectures and Presentations on the Intermediate and Short Term Seismic Hazard, Ground Motion Alerts and Re-entry**
Monday, 18h30	Dinner and Pre-dinner talk by Dr Steve Spottiswoode on **Reflections on 50 Years of Mine Seismology**
Tuesday 30 May 09h00 - 18h00	**Mine Seismology Seminar Day2: Lectures and Presentations on the Applications of Ambient Noise and Distributed Acoustic Sensing, DAS, in Mining.** Keynote by Prof. Roel Snieder on **Measuring Variations in the Seismic Velocity as a Diagnostic of Rock Damage and Healing.**

Training Courses, Asara Wine Estate, South Africa

Sunday 28 May 09h00 - 16h00	**Seismology Primer for Geotechnical Consultants,** IMS Seismologists
Wednesday 31 May 09h00 - 13h00	**Ground Motion and Rockburst Hazard in Underground Mines,** Dr Aleksander Mendecki and Dr Dmitriy Malovichko
Wednesday 31 May 14h00 - 17h00	**Numerical Modelling with Seismic Data: Mining Scenarios,** Jacques Gerber and Dr Dmitriy Malovichko
Thursday 1 June 09h00 - 13h00	**Ambient Noise Tutorials**, Prof. Roel Snieder, Head of the Center for Wave Phenomena, Colorado School of Mines
Thursday 1 June 14h00 - 17h00	**Modelling the Effects of Fluid Injection,** Dr Vladimir Lyakhovsky, Numerical Modelling Consultant
Friday 2 June 09h00 - 16h00	**Interpretation of Seismic Data with IMS Software,** IMS Seismologists

For more information on registration, accommodation and social programme please contact SanMarie.Botha@imseismology.org

Objectives of the Seminar

Considerable progress has been made in the quantification of seismic sources and in the quantification of seismicity. Most modern seismic systems are capable to locate seismic events accounting for rock mass heterogeneity, to quantify seismic sources by their potency and energy and to invert for source mechanism. Seismicity is routinely characterised by its size and time distributions and by parameters reflecting changes in the strain and stress regime and the rheological properties of the rock mass deformation associated with the seismic radiation. Although seismic waveforms do not provide direct information about the absolute stresses and strains, they do provide useful information about stress orientation and about the spatial and temporal strain and stress changes. However, all these seismological parameters and seismic patterns are not always translated into a practical instruments to manage seismic hazard in mine.

We will discuss methodologies to assess the long, intermediate and short term seismic hazard. It will include data selection, the expected next record breaking event magnitude, the power law size distribution and its intricacies, the Ground Motion Prediction Equation, distribution of distances and mapping the ground motion hazard in space. We will also discuss the short term hazard in the context of re-entry protocol. The new method to assess the likelihood of rockburst damage will be presented. It incorporates rock mass properties, stress field, geometrical characteristics of excavations, seismic data and parameters of ground support.

Most applications of modelling with seismic data to date were limited to qualitative correlation between location and mechanisms of events with the modelled stresses. We will report encouraging results on the quantitative correlation that makes it possible to improve numerical modelling. We will also discuss methodology of modelling the influence of hydraulic fracturing on stress redistribution.

Over the last few years we've made considerable progress in the quantification of rock mass properties and monitoring their changes in space and time. Recent advances in active seismic monitoring, seismic interferometry and ambient noise analysis achieve a resolution at least 100 times better than classical seismic velocity inversion. This is useful to monitor the real-time stress changes in 3D due to mining, as well as quantification of pillar strength and more accurate cave front tracking in block cave mines. These advances have also enabled us to directly image and monitor areas affected by mining activities where classical seismology has not been very effective, such as tailings dams, old mine workings and natural caves.

The main themes of the Seminar are:

- Ground Motion and Rockburst Hazard.
- Ground Motion Alerts and Re-entry.
- Managing Seismicity in Block Cave and Tabular Mines.
- Seismic Hazard Management Plan.
- Numerical Modelling with Seismic Data.
- In-Mine Seismic: In-mine Exploration and Rock Mass Characterisation.
- Progress in Seismic Monitoring Technology and DAS.

I'm asking all presenters to tell us: (1) why you did this work, (2) how you did it, (3) what you found, (4) what you think it means, and (5) what are the limitations.

Looking forward to see you in South Africa in May 2023
Aleksander J. Mendecki
Chairman and Head of Research
Institute of Mine Seismology

Confirmed Lectures and Presentations

Welcome and Introduction: Mine Seismology Past, Present and Future
Dr Aleksander Mendecki, Chairman, Institute of Mine Seismology

Measuring Variations in the Seismic Velocity as a Diagnostic of Rock Damage and Healing
Prof. Roel Snieder, Center for Wave Phenomena, Colorado School of Mines, USA

Quantitative Forecasting of Mining Induced Seismic Event Hazards
Dr David Beck, Beck Engineering, Australia

Managing Large Scale Seismicity in a Deep, High Stress Block Cave (DMLZ)
Hendri Silaen and Turgod Nainggolan, PT Freeport Indonesia

Seismicity and Caving to an Open Pit (GBC)
Zaki Fajri, PT Freeport Indonesia

Introduction to Oyu Tolgoi Advance Monitoring System Design - An Integrated Ground Hazard and Cave Performance Monitoring System
Erdenetogtokh Bayar, Oyu-Tolgoi, Rio Tinto Copper, Mongolia

Pre-conditioning and Seismic Response in a Caving Mine
James Lett, Newcrest, Australia

Advanced Geotechnical and Seismic TARP's Developed for Seismically Active Mining Areas at Telfer
Matthew Woods, Newcrest, Australia

Rockburst Hazard Assessment: Cadia Case Study
Dr Gisela Viegas Fernandes, Newcrest, Australia

Firing Induced Seismic Exclusions for Undercut, Drawbell and Slot Firings in New Cave Panels Based on Analysis of Past Seismic Response in Existing Panels
Presented by Dr Gisela Viegas Fernandes, Newcrest, Australia

Mining Rock Mass Seismicity (MRS) Model - A Numerical Methodology to Assess the Seismic Potential of the Rock Mass Response to Mining
Ronald Lachenicht, Itasca, Australia

Seismic Hazard Management - Something Old, Something New
Lourens Scheepers, Sibanye Stillwater, South Africa

3D Elastodynamic Modelling Applied to Complex Blasting Problems
Dr Lindsay Linzer, SRK, South Africa

Numerical Modelling of Seismic Activity in Ultra-Deep Mines Using BEM
Jacques Gerber, Institute of Mine Seismology, South Africa

Numerical Modelling of Seismic Events Using the Material Point Method
Jurgens Gouws, Institute of Mine Seismology, South Africa

Underground Observations of Seismic Sources in Deep South African Gold Mines
Johan Blignaut, Institute of Mine Seismology, South Africa

Rockburst Hazard Forecasting
Dr Dmitriy Malovichko, Institute of Mine Seismology, Australia

Modelling the Interaction of a Finite Thickness Source with a Tunnel
Dr Vladimir Lyakhovsky and Dr Aleksander J. Mendecki, Institute of Mine Seismology

Seismic Monitoring of Rock Mass Stability for Controlled Mining
Dr Aleksander Mendecki, Institute of Mine Seismology

Ground Motion Alerts – GMAP and GMAS
Dr Aleksander Mendecki, Institute of Mine Seismology

Ground Motion Based Fixed Exclusion Rules for Blasting and Large Seismic Events
Dr Cornel du Toit, Institute of Mine Seismology, South Africa

Large Scale Dynamic Test of Ground Support Systems at the Walenstadt Testing Facility
David Cuello, Principal Consultant, GMT, Australia and German Fischer, Geobrugg, Chile

Recent Development in Automatic Processing of Seismic Monitoring Data
Dr Martin Gal, Institute of Mine Seismology, Australia

GMAS – Technology for Ground Motion Alerts
Dolf Bredenkamp, Institute of Mine Seismology, South Africa

Advances in Seismic Monitoring Technologies Including Integration of DAS Into a Realtime Monitoring System
Gareth Goldswain, Institute of Mine Seismology, Australia

Introduction to Ambient Noise Methods
Dr Francois Malan, Institute of Mine Seismology, South Africa

Combining Micro-seismic Monitoring and Continuous Ambient Noise for Slope Stability Monitoring
Dr Monty Rohwer, Institute of Mine Seismology, South Africa

Ambient Noise for Greenfields and Brownfields Exploration
Dr Ruan Viljoen, Institute of Mine Seismology, South Africa

Monitoring an In-Stope Pillar in a Deep Gold Mine by Active Seismic Source
Mark Green, Institute of Mine Seismology, South Africa

Properties of the Fault That Hosted the 2014 M5.5 Earthquake Beneath Moab Khotsong Gold Mine (South Africa) Revealed by 2- and 3D Reflection Seismics, Aftershocks and ICDP-DSeis Drill Core and Borehole Logs. Authors: Prof. Hiroshi Ogasawara, Ritsumeikan University, Japan, Yasuo Yabe, Tohoku University, Japan, Musa Manzi and Prof. Ray Durrheim, University of the Witwatersrand, South Africa
Presented by Prof. Ray Durrheim, University of the Witwatersrand, South Africa.

Eramin-FUTURE project to image the Wrench Fault at South Deep Mine (South Africa) using active and passive sources monitored by sensors deployed on the surface, in tunnels and boreholes. Authors: Musa Manzi and Moyagabo Rapetsoa, University of the Witwatersrand, South Africa, Alireza Malehmir, Uppsala University, Sweden, Valentina Socco, Polytechnico Torino, Italy and Prof. Ray Durrheim, University of the Witwatersrand, South Africa
Presented by Kenneth (Moyagabo) Rapetsoa, PhD candidate of University of the Witwatersrand, South Africa

Courses and Tutorials

Pre-Seminar Course – Seismology Primer

Sunday 28 May, 09h00 - 16h00, Asara Wine Estate, Stellenbosch

Instructors:
Dr Gerrie van Aswegen, Dr Francois Malan, Shane Kohler, Johan Blignaut and **Dr Cornel du Toit,**
Institute of Mine Seismology South Africa

1. Objectives of seismic monitoring: rescue, prevention, hazard assessment, alerts and back analysis.
2. Seismic waves: sources of seismic waves, acceleration, velocity and displacement of ground motion, ground velocity vs. (propagation velocity.
3. Ambient noise: what is it, data collection and processing, applications, requirements.
4. Seismic events: event locations and location errors, design principles of seismic network configuration, velocity calibration, calibration blasts and Wadati diagram.
5. Direct source parameters: origin time and location, Fourier transformation, frequency decomposition, spectra and spectral parameters, seismic potency, seismic moment, radiated energy, corner frequency and size.
6. Derived source parameters: static and dynamic stress drop, apparent stress, apparent volume, energy index, time histories of seismic parameters, cumulative plots.
7. Magnitude scales: local, moment or potency magnitudes, energy magnitudes.
8. Source mechanisms: types of faults, radiation patterns and fault plane solutions, moment tensors, slip inversion, stress inversion.
9. Size distribution hazard: size distribution (Gutenberg-Richter relation), seismic hazard and risk, probabilities and hazard maps.
10. Short term hazard: short term hazard assessment, ground motion alerts and re-entry.
11. Ground motion hazard

Ground Motion and Rockburst Hazard in Underground Mines

Wednesday 31 May, 09h00 - 13h00, Asara Wine Estate, Stellenbosch

Instructors:
Dr Aleksander J. Mendecki, Institute of Mine Seismology, South Africa and Australia
Dr Cornel du Toit, Institute of Mine Seismology, South Africa
Dr Dmitriy Malovichko, Institute of Mine Seismology, Australia

1. Ground Motion Hazard
1.1 Ground motion at source – limits and scaling.
1.2 Peak ground velocity (PGV), acceleration (PGA) and displacement (PGD), ejection velocity. Duration of strong ground motion, Cumulative Absolute Displacement (CAD).
1.3 Ground Motion Prediction Equation (GMPE) and its utility.
1.4 Seismic fragility curves and damage potential.
1.5 **Influence-based Ground Motion Alerts for mines: GMAP and GMAS.**
General. The measures of influence are the peak ground velocity, PGV, and the cumulative absolute displacement, CAD, since their influences on a specific site in mine are moderated by the distance from the seismic source to the place of potential exposure. Therefore, we can take into account the influence of ground motion generated by all available seismic events, regardless of their location, on a particular working place – no need for polygon. The CAD becomes $CAID$, i.e. Cumulative Absolute Inelastic Deformation, if the co-seismic strain exceeds the elastic threshold

for hard rock. Alerts and Alarms are triggered if the rates of $CAID$ and/or its activity, $ACAID$, exceed predefined reference levels. Since they have different units, we normalise each by its reference level and at each time step select the one which is greater and call it the GMAP rating. All points that at a given time trigger an Alert define the minimum exclusion zone and are monitored as time progresses.
- Polygon-less method – GMAP. Here both $CAID$ and its activity $ACAID$ are calculated for each point of interest from the GMPE developed for a given mine.
- Polygon-less real time system – GMAS. Here $CAID$ and its activity $CAID$ are automatically derived by the GMAS hardware unit from the continuous data stream of ground motion recorded by GMAS sensors.
1.6 Re-entry and exclusion rules for blasting and large seismic events.

2. Rockburst Hazard
2.1 Terminology – shakedown and strain-bursting damage mechanisms, rockburst potential and rockburst hazard.
2.2 Input of rockburst hazard assessment – rock mass properties, geometry of excavations, stress model, seismic data, ground support.
2.3 Utilisation of seismic data – assessment of strain-bursting depth and duration of bulking, probability and percentage of the dynamic realisation of extreme depth of failure, increase in the depth of failure and consumption of ground support capacity.
2.4 Calculation and presentation of results – mapping of parameters and results on tunnel nodes, energy vs displacement plot of ground support capacity and demand, safety margin of displacement.

Numerical Modelling with Seismic Data

Wednesday 31 May, 14h00 - 17h00, Asara Wine Estate, Stellenbosch

Instructors:
Jacques Gerber, Institute of Mine Seismology, South Africa
Dr Dmitriy Malovichko, Institute of Mine Seismology, Australia

1. Validation and improvement of input modelling parameters.
1.2 Failure criteria – cohesion and friction angle for rock mass and weak structures.
1.3 Methodology – trial-and-error vs iterative calibration.
1.4 Examples.
2. Modelling of seismic sources and seismicity.
2.1 Boundary Element and Material Point Methods – modelled parameters of seismic events: location, seismic potency, source mechanism. Catalogues of modelled seismic events.
2.2 Utilisation – forensic analysis of damaging events, ground motion hazard for the scenarios of mining.
2.3 Examples.

Ambient Noise Tutorial

Thursday 1 June, 09h00 - 13h00, Asara Wine Estate, Stellenbosch

Instructor. **Prof. Roel Snieder**, Head of the Center for Wave Phenomena, Colorado School of Mines

1. Time-lapse Changes and Healing of Earth Materials
2. Seismic Interferometry

Modeling the Effects of Fluid Injection: Stable vs Runaway Fracturing

Thursday 1 June, 14h00 - 17h00, Asara Wine Estate, Stellenbosch

Instructor. **Dr Vladimir Lyakhovsky**, Numerical Modelling Consultant.

1. General observations and concepts: fracture and friction, three-body model, linear and non-linear rock elasticity.
2. Elasticity of the damaged rocks.
2.1 Elastic energy of the damaged rocks.
2.2 Pore-elastic media, Biot effective stress.
2.3 Effective moduli and dilation.
2.4 Seismic waves.
3. Kinetic of the damage accumulation and healing.
3.1 Basic thermodynamic relations: Scalar damage model, coupling damage and porosity, effective stress and coupling with fluid flow.
3.2 Yielding cap for porous rocks.
3.3 Critical damage and synthetic seismic event.
4. Numerical aspects.
4.1 Finite Element Method (FEM) for fluid pressure.
4.2 Fast Lagrangian Analyze of Continua (FLAC) for mechanical part.
4.2 Stress drop simulation in quasi-static long-term model.
5. Model application to hydro-fracturing: injection-induced seismicity.
5.1 Role of the intermediate principal stress on the direction of damage zone.
5.2 What controls the rate of fracturing and induced seismicity?
5.3 Injection pressure vs fluid flux controlled fracturing.
5.4 Stability of the stimulated process.
5.5 Run-away versus stable hydro-fracturing.
5.6 Interaction with pre-existing faults: re-activation vs. stabilization.

Interpretation of Seismic Data with IMS Tools

Friday 2 June, 09h00 - 16h00, Asara Wine Estate, Stellenbosch

Instructors: IMS Seismologists.

1. *Ticker3D*: initial configuration, viewing recent seismicity, long term seismicity, system health and Ground Motion Alert Programme (GMAP).
2. *Trace:* seismological processing: location, source parameters, velocity structure, user management.
3. *Vantage* Visualisation: interacting with the 3D viewer, loading and customising mine plans, loading seismic data from IMS database server, colouring and sizing of events, temporal and spatial filtering of the data, displaying source mechanisms.
4. *Vantage* Advanced Analysis: analysis in temporal, spatial and parameter domains, time histories, contours (event parameter gridding onto meshes), energy-potency plots, rank statistics of ground motions, event size distribution: open-ended and upper-truncated models, maximum size of event, probability table, source mechanisms: stereo-net of principals axes, nodal planes and poles, Hudson's source type plot, Frohlich's ternary graph.
5. Rockburst Hazard Assessment – *RBHA*: Importing geometry of excavations, rock mass properties, stress model, seismic data, ground support parameters; establishing tunnel nodes; using timeline; calculation of results (rockburst potential and rockburst hazard); presentation of results - maps, time histories, energy vs displacement plot.


MINOVA
HIGH PERFORMING
ROCK SUPPORT
SOLUTIONS
GROUND AND WATER CONTROL
We work with our mining customers to create solutions that improve efficiency, cost and safety. We supply a full portfolio of rock support products, backed by skilled and highly experienced technical sales and service teams. We are experts in identifying project needs, providing training and assisting with applications within our portfolio.
WE OFFER:
> Tekcrete high strength sprayed cement
> Lokset Resin capsules
> Capcem encapsulated and pumpable cement grouts
> Pumpable resins for rock bolting, consolidation and water stopping
> Steel and GRP Rock bolts and tendons
> Mining meshes
> Pumps and accessories for product application
minovaglobal.com | globalmarketing@minovaglobal.com | +27(11) 9231900
23 Botha Street, Alrode, South Africa, 1451

How to become a Rock Engineering Practitioner

1. Introduction

In recent times there have been a number of enquiries of how one goes about becoming a qualified rock engineer. The purpose of this note is to try and answer this question, but also provide some interesting background information on the Chamber of Mines (COM) rock mechanics certificates.

2. History of the certificate

The Chamber of Mines Certificate in Rock Mechanics (COMCRM) was introduced into the South African mining industry in the 1970's by rock mechanic practitioners in an attempt to regulate and standardize rock mechanics practitioner competency. Initially the Rock Mechanics Departments in the various mining houses did their own internal development of what is now known as Rock Mechanic Officers/Practitioners. A shortcoming was identified when these persons wanted to move between mining houses, in that they could not produce an industry-accepted certificate of competency.

Based on this shortcoming, the Group Rock Engineers Committee (one of the sub-committees of the Chamber of Mines) decided to initiate a Rock Mechanics Certificate of Competency. The issuing of the Chamber of Mines' Rock Mechanics Certificate commenced in 1977, with Ken Hattingh being the first person to be awarded this certificate. Initially the certificate was only applicable to hard rock tabular mining, although the soft rock tabular mining option followed a few years later.

Initially, the entire examination was conducted underground - the candidates accompanied the examiners underground and were questioned extensively underground to test their competence. As time progressed, first one, then two, and finally three written papers were introduced in addition to the practical assessment.

The certificate has become a pre-requisite for rock mechanic practitioners to practice in South Africa. In 2002 this was written into law, with Regulation 14.1 (8) of the regulations related to the Mine Health and Safety Act (Act 29 of 2001) stating that:

"At every underground mine where a risk of rock bursts, rock falls or roof falls exists, and at every other mine where a significant risk of rock bursts, rock falls or roof falls exists, the employer must ensure that the input of a competent person is properly and timeously considered and integrated into mine design, planning and operations."

In chapter 22 of these regulations, the competent person referred to in regulation 14.1(8) is defined as "…a person who is at least in possession of either the Chamber of Mines Certificate in Rock Mechanics [Metalliferous Mines], or the Chamber of Mines Certificate in Rock Mechanics [Coal Mines}, whichever is appropriate for the type of mine concerned."

For many years, Up until May 2007, the certificate only catered for underground tabular mines such as gold, platinum and coal. In May 2007 the syllabus was extensively updated and revised, reference to more recent textbooks were included and the scope of the certificate was expanded to include massive underground and open pit disciplines as specific options.

3. Where do you start?

The 1st step in becoming a qualified rock engineer is to register for, and pass the COM Strata Control Certificate of Competence. This certificate consists of a theory and practical examination. The theory examination is administered by the COM and there are two examinations in a calendar year, towards the end of May and October respectively. The pass mark for the theory paper is 60% and 80% for the practical.

The practical examinations are conducted by the various mining companies and you need to make arrangements with a company if you are not working for a mining company. The practical examination is typically organized within 60 days of the written examination. You can attempt the practical examination without having passed the theory and vice-versa. However, you are only allowed to attempt one practical examination for every theory examination attempted. In order to manage this you need to register on the SANIRE website before you can attempt the SCO practical examination.

Syllabi for both the theory and practical examination are available on the SANIRE website (Click here). Past papers and model answers are also available on the website to assist candidates with their examination preparation. (Click here)

Rock Engineers come from various backgrounds and at this stage you do not need any qualification to register for the examinations, but a minimum of a Grade 12 with mathematics and science is recommended, due to the nature and complexity of the examinations. The COM will issue you with a COM Strata Control Certificate of Competence once you have successfully completed both parts of the certificate.

4. What is the next step?

The next step is to complete the COM Rock Mechanics Certificate of Competence. This qualification consists of 4 parts, 3 theory papers and a practical examination. Pass mark for all four papers is 60%. Two of the theory papers are common to all mining disciplines and one paper is sub-divided into the four options. The theory papers are:

- Paper 1: Basic Theory
- Paper 2: General
- Paper 3: Applications
    - P 3.1 Hard Rock Tabular (Typical tabular gold and platinum mines)
    - P 3.2 Soft Rock Tabular (Typical tabular coal mines)
    - P 3.3 Massive Mining
    - P3.4 Open Pit Mining

In contrast to the SCO certificate, a candidate must pass all three theory papers before he/she can attempt the practical examination.

There are syllabi, suggested reference textbooks and links to learning material for the various subjects available on the SANIRE website (SANIRE - South African National Institute of Rock Engineering - Home). Past papers and model answers are also available on the website to assist candidates with their examination preparation. (Click here)

The COM will issue a COM Rock Mechanics Certificate of Competence once you have successfully completed all four parts of the certificate. Your certificate will indicate which mining discipline you are competent in and you will have to pass all the application theory papers (3.1 – 3.4) as well as the practical examinations associated with these if you want to be declared competent for all.

For example: If you passed P1, P2 and P3.1 + the appropriate practical examination, your certificate will reflect only Hard Rock Tabular. If you then want to add soft rock tabular you need to write P3.2 and the relevant practical. Your initial certificate will then be withdrawn and a new certificate issued that will reflect both hard and soft rock tabular.

The examinations are set by the SANIRE examinations committee which consists of experienced rock engineering practitioners. If you want more information regarding the examination committee and the administration of the examinations itself, you can read the "Guidelines to the Rock Mechanics Certificate" which can be found on the website. (Click here)

5. Where to from here?

Once you have passed the COMRMC you can study towards the Advanced Rock Engineering Certificate (COM AREC). This certificate is awarded subject to you having completed 6 courses (4 compulsory subjects, 2 optional subjects) on a post-graduate level at a nominated university (currently Wits University or Pretoria University).

Once you have completed the necessary courses, you request that the university writes a letter of recommendation to the COM, which will issue you with the Advanced Certificate. This certificate is not required by the Mine Health and Safety Act (MHSA) but many companies require this qualification for promotion to the level of rock engineering manager.

You can also opt to study towards a Masters' degree or Doctorate, specialising in rock engineering, but you will probably require a 1st degree (or other suitable tertiary qualification) to be accepted by a university for post-graduate studies.

6. Career Path

A typical career path for a rock engineer is shown in Table 1 below. The nomenclature used for the different roles change from company to company and between disciplines.

Table 1: Typical career path and associated qualifications

Role	Qualification	Comment
Strata Control Observer	Generally none required but there are MQA accredited courses available	This role is typically the collection of geotechnical data
Strata Control Officer	COM Strata Control Certificate	Will start doing analyses of data and make low level recommendations.
Rock Engineer / Senior Rock Engineer	COM Rock Mechanics Certificate	Higher level of analyses and input into mine design and layouts as well as design of support systems.
Rock Engineering Manager	COM Rock Mechanics Certificate Some companies require the COM Advanced Rock Engineering Certificate. At least 5 years experience as a SRE is required.	High level of technical knowledge as well as managerial skills required for this role as you start managing a rock engineering department on an operation
Principal Rock Engineer/ Manager: Rock Engineering	COM Rock Mechanics Certificate COM Advanced Rock Eng certificate. MSc or MEng is advantageous At least 5 years experience as a REM is required	Provides expert advice on geotechnical interpretations to solve complex technical investigations including probabilistic analysis, and drives improvements in mine safety and efficiency
Manager: Rock Engineering/ Group Rock Engineer	COM rock mechanics certificate Advanced certificate. MSc or MEng degree At least 5 years experience as a PRE is required	Drives the development and application of technical analysis, translating insights from research / global operations and setting strategy for future mines

ProVest Group

Provest was awarded the contracts to establish the TRP Merensky waste Boxcut and the 10-meter portal stub. Due to extremely challenging ground condition the initially planned footprint was much larger than planned and required extensive additional support to support and stabilize the Boxcut and the Boxcut highwall. 6-meter-long grouted bolts with mesh and 100mm shotcrete was applied to stabilize the ground. The portal stub intersected weathered and fractured ground that was supported with resin bolts and shotcrete. After moving the portal highwall to a much higher position the ground conditions stabilized, and the project was handed over to TRP at the end of December 2022. The whole project was concluded with Zero accidents.

Secondary Support Installation

ProVest supply and apply a pre-bagged blend of sand, aggregate, cement, fibres and other additives in shotcrete and wet-crete derivatives. The high quality products are supplied in 25kg and 30kg to produce different strengths of 30Mpa to 100Mpa.

Our teams are highly experienced in the application of these products.

Anchors & Tendons Installations

The ProVest Group performs a variety of long anchor installation which vary between 3.5m to 6.5m.

Various types of roof bolt, resin bolt and coupling bolt installations are also undertaken.

Grout Efficiency Tester

The adequate grouting of Cable Anchors has been a major concern over the last few decades.

Our GET is a simple, user-friendly system that determines whether Anchor holes are fully column grouted.

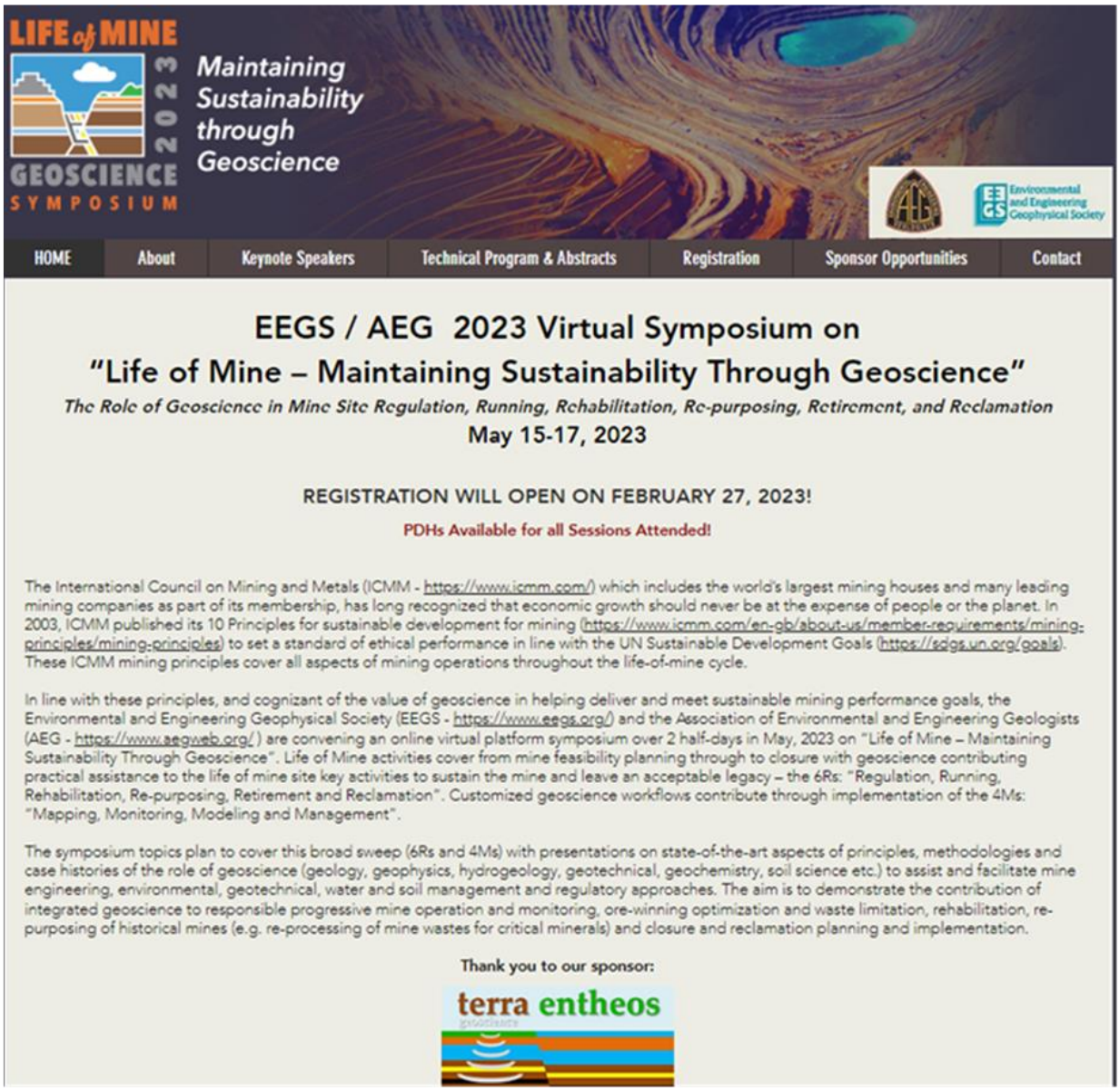

SHOTCRETE


WETCRETE


CABLE ANCHORS

GROUT EFFICIENCY TESTER

Cement & Aggregate Products • Specialised Support Services • General Mining Services • Innovative Technology Solutions


LIFE of MINE
GEOSCIENCE
SYMPOSIUM
2023
Maintaining Sustainability through Geoscience
Environmental and Engineering Geophysical Society
HOME
About
Keynote Speakers
Technical Program & Abstracts
Registration
Sponsor Opportunities
Contact
EEGS / AEG 2023 Virtual Symposium on
"Life of Mine – Maintaining Sustainability Through Geoscience"
The Role of Geoscience in Mine Site Regulation, Running, Rehabilitation, Re-purposing, Retirement, and Reclamation
May 15-17, 2023
REGISTRATION WILL OPEN ON FEBRUARY 27, 2023!
PDHs Available for all Sessions Attended!
The International Council on Mining and Metals (ICMM - https://www.icmm.com/) which includes the world's largest mining houses and many leading mining companies as part of its membership, has long recognized that economic growth should never be at the expense of people or the planet. In 2003, ICMM published its 10 Principles for sustainable development for mining (https://www.icmm.com/en-gb/about-us/member-requirements/mining-principles/mining-principles) to set a standard of ethical performance in line with the UN Sustainable Development Goals (https://sdgs.un.org/goals). These ICMM mining principles cover all aspects of mining operations throughout the life-of-mine cycle.
In line with these principles, and cognizant of the value of geoscience in helping deliver and meet sustainable mining performance goals, the Environmental and Engineering Geophysical Society (EEGS - https://www.eegs.org/) and the Association of Environmental and Engineering Geologists (AEG - https://www.aegweb.org/) are convening an online virtual platform symposium over 2 half-days in May, 2023 on "Life of Mine – Maintaining Sustainability Through Geoscience". Life of Mine activities cover from mine feasibility planning through to closure with geoscience contributing practical assistance to the life of mine site key activities to sustain the mine and leave an acceptable legacy – the 6Rs: "Regulation, Running, Rehabilitation, Re-purposing, Retirement and Reclamation". Customized geoscience workflows contribute through implementation of the 4Ms: "Mapping, Monitoring, Modeling and Management".
The symposium topics plan to cover this broad sweep (6Rs and 4Ms) with presentations on state-of-the-art aspects of principles, methodologies and case histories of the role of geoscience (geology, geophysics, hydrogeology, geotechnical, geochemistry, soil science etc.) to assist and facilitate mine engineering, environmental, geotechnical, water and soil management and regulatory approaches. The aim is to demonstrate the contribution of integrated geoscience to responsible progressive mine operation and monitoring, ore-winning optimization and waste limitation, rehabilitation, re-purposing of historical mines (e.g. re-processing of mine wastes for critical minerals) and closure and reclamation planning and implementation.
Thank you to our sponsor:
terra entheos

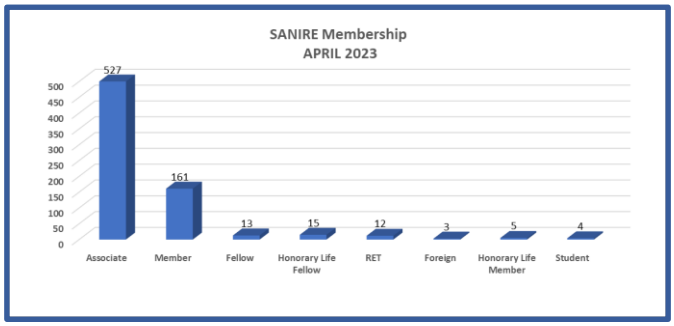

SANIRE
ROCKtalk
WE ARE LOOKING FOR YOU
WE VALUE YOUR INPUT AND WE ARE CALLING ON OUR MEMBERS TO CONTRIBUTE CONTENT TO THE SANIRE NEWSLETTER
THIS IS AN OPEN INVITATION CALL FOR ARTICLES
SUBMISSION CATEGORIES
SUBMIT AN ARTICLE AND STAND A CHANCE OF WINNING
SANIRE MEMORABILIA
FOR FURTHER ENQUIRIES OR TO SUBMIT YOUR PROPOSAL PLEASE SEND AN E-MAIL TO:
info@sanire.co.za
VIEW THE LATEST ISSUE OF ROCKtalk
www.sanire.co.za

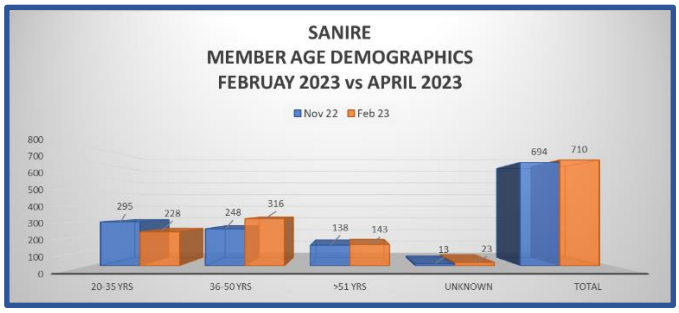

SANIRE
ROCKtalk
ADVERTISING SPACE NOW AVAILABLE
WE HAVE INCREASED THE ADVERTISING OPPORTUNITIES FOR COMPANIES WHO WOULD LIKE TO MARKET THEIR PRODUCTS AND SERVICES IN THE SANIRE NEWSLETTER.
CONTACT US TODAY TO SECURE A SPACE IN THE NEXT ISSUE OF ROCKtalk
PRICES FOR DIFFERENT SIZES OF ADVERTISEMENTS
BOOK YOUR SPACE: info@sanire.co.za
VIEW THE LATEST ISSUE OF ROCKtalk
www.sanire.co.za

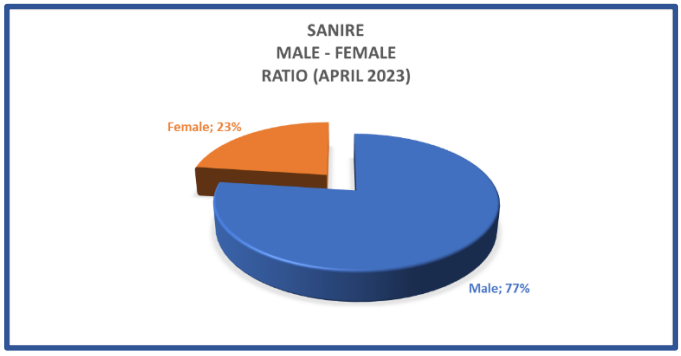

SANIRE
ROCKtalk
WE ARE LOOKING FOR THE NEXT ROCK Star
NOMINATIONS ARE NOW OPEN
WE ARE SEARCHING FOR THE NEXT ROCK STAR WHO IS GOING ABOVE AND BEYOND
Please send us your nomination of who you would like to see interviewed in the next issue of ROCKtalk
DEADLINE FOR NOMINATIONS 27 JUNE 2022
PLEASE INCLUDE THE FOLLOWING IN YOUR NOMINATION
Name & Surname of Nominee
Mining Operation of Nominee
Designation of Nominee
Nominee's contact details
A short motivation as to why you have nominated the person
FOR FURTHER ENQUIRIES OR TO SUBMIT YOUR NOMINEE PLEASE SEND AN E-MAIL TO:
info@sanire.co.za
VIEW THE LATEST ISSUE OF ROCKtalk
www.sanire.co.za

SANIRE
SOUTH AFRICAN NATIONAL INSTITUTE OF ROCK ENGINEERING

MORE ABOUT SANIRE







FOR MORE INFORMATION, CONTACT SANIRE

Mbalenhle Buthelezi
Association Secretary
Tel: (+27) 11 568 2050 | (+27) 11 568 2054
Email: mbalenhleb@mpas.org.za | info@sanire.co.za
Website: www.sanire.co.za
Facebook: @SanireOfficial

SANIRE
SOUTH AFRICAN NATIONAL INSTITUTE OF ROCK ENGINEERING

EDITORS CORNER

This is our newsletter and SANIRE would like to hear from you.

If you have any information or stories you would like us to include in the next newsletter, please submit them via email to mbalenhleb@mpas.org.za , Thovhedzo.Gcuda@Seritiza.com and lizelle.prinsloo@angloamerican.com

Remember to visit all our media platforms.

Facebook: @SANIREofficial (https://www.facebook.com/SanireOfficial)

LinkedIn www.linkedin.com/company/south-african-national-institute-of-rock-engineering