ELIMINATION OF FALL OF GROUND (FOG) FATALITIES

ACTION PLAN

July 2021

MINERALS COUNCIL
SOUTH AFRICA

BACKGROUND

At the CEO Zero Harm Forum meeting on 5 March 2021, the CEOs deliberated on the 2020 industry safety performance regression. An investigation into the leading causes of fatalities in the South African mining industry revealed that in 2020 fall of ground (FoG) related incidents accounted for 22 of the 60 overall fatalities (37%). The analysis also showed that over the past three years, FoG safety performance plateaued. A total of 22 FoG fatalities were reported in 2018 and 20 in 2019.

Globally, the ICMM 2020 Safety Performance Benchmark Report indicated that half of their members' fatalities were in South Africa and that 22 FoG fatalities were due to the prevalence of deep, high stress mines in South Africa. The ICMM recognised the existence of the Minerals Council's CEO Zero Harm Forum to address key challenges to accelerate the industry's journey to zero harm with fall of ground the focus in 2021.

To this end, the CEOs mandated the Rock Engineering Technical Committee (RETC) of the Minerals Council, with the support of the South African National Institute of Rock Engineering (SANIRE), to present an action plan to eliminate FoG fatalities in their next meeting of July 2021.

CONSULTATION PROCESS

The RETC and SANIRE welcomed the opportunity and held multiple consultative workshops. These were attended by members from the Minerals Council, the RETC and the SANIRE. Information presented included:

- 2020 industry performance: A Preliminary Deeper Analysis of the Regression
- The proposed South African Mining Industry Parent-Case Bowtie for Gravity-Induced FoGs
- An analysis of the Mine Health and Safety Council (MHSC) research projects on areal support, illumination, integrated thermal imaging and acoustics device, and the lighter aluminium pinch bar
- An analysis of the industry's FoG safety statistics

The analysis for the industry shows a steep reduction in FoG fatalities between 2003 and 2011, followed by a plateauing period between 2012 and 2020. The fatality frequency rate (FFR) of gold, platinum and 'other commodities' continued to reduce at a slow rate over the latter period, with coal increasing to an FFR similar to that in the platinum sector. The analysis identified barring practice as one of the high-risk activities. Barring-related incidents accounted for almost 60% of FoG incidents.

Based on the information presented and workshop attendees experience, a "think tank" approach was adopted to identify possible solutions. Following the consultative workshops, a smaller team was nominated to finalise the recommendations to be presented to the CEO Zero Harm Forum.

The workshop attendees identified various issues to be considered by the industry to combat FoG related fatalities. To assist with classification, these were allocated into the various components of the Industry Ground Control Framework (IGCF) as approved by the CEO Zero Harm Forum in 2019. It was concluded that bold, heartfelt actions were needed to bring about a step-change in the elimination of FoG fatalities.

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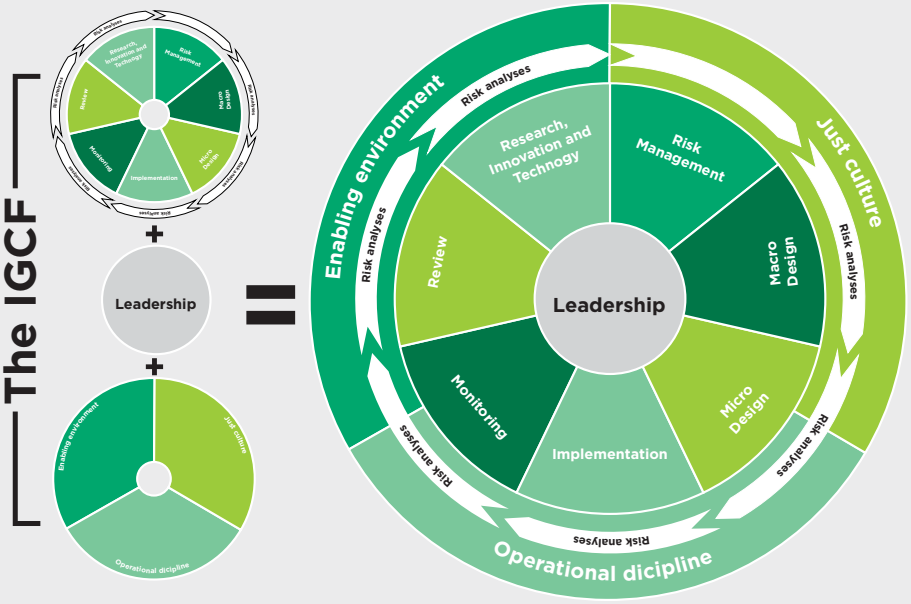
Industry Ground Control Framework

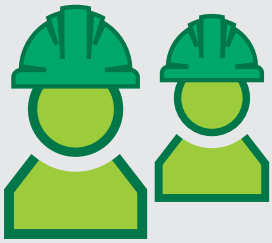


In early 2000, approximately R30m per year was spent on FoG related research, which equates to more than R70m per year today. Many challenges at the MHSC have affected the implementation of an effective FoG research programme. In the past ten years, only eight rock-related projects were completed. Since 2016 to date, there has been little or no progress on the execution of the six rock-related projects currently in the MHSC research programme, despite the best endeavours of employer representatives (this also applies to other MHSC research projects). Between 2010 and 2012, the average annual research spend of the MHSC was above R20m. From 2013 to 2020, it declined to less than R10m, with only R4m spent in 2020.

The challenges of the rock engineering profession have also been considered. Since the inception of the Chamber of Mines Certificates in 1977, a total of 631 Rock Engineering Tickets have been issued. Only 180 ticket holders are currently practising. Over the last couple of years there has been a massive exodus of experienced rock engineers out of the country. In 2020 alone, a total of 20 rock engineers emigrated to Australia and Canada. Another challenge is that most experienced rock engineers are nearing retirement. The younger generation of rock engineers require coaching and mentoring to get them to be fully competent. Like many state institutions, the Mining Qualifications Authority is also experiencing a variety of challenges.

It was noted that most of the behavioural challenges related to accidents are not due to deliberate or malicious violations, but often due to 'planisa' (shortcuts) to get the job done, while the time available for the mining cycle is being affected by the increased depth and distance from the shaft.

The support of mine managers, as represented by the Association of Mine Managers of South Africa (AMMSA) and the South African Collieries Managers Association (SACMA), is critical in the implementation of health and safety action plans. Hence, these associations were also requested to comment on the recommendations made in the Elimination of FoG Fatalities Action Plan and their comments have been duly incorporated.



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RECOMMENDATIONS

Current initiatives that are being implemented within the Minerals Council, the MHSC and the Mandela Mining Precinct (MMP) were recognised and supported as these have a significant impact on FoG safety. These initiatives should be completed as speedily and effectively as possible and include:

Modernisation of the mining process, for example, hydropower drilling, mechanised roof bolting, Wi-Fi communication, paper-free reporting, mechanised cutting, etc

An investigation into a longer-term move towards mechanised cutting (research and development)

The project on digitisation of safety data that could address the South African Mines Reportable Accidents Statistics System (SAMRASS) shortcomings and facilitate a better and faster analysis of safety data

The MHSC is busy with a turnaround plan to improve delivery

After extensive deliberations and consultations, the following recommendations were made on the Elimination of FoG Fatalities Action Plan:

1 ADOPTION OF LEADING PRACTICES

Minimise rock mass damage from drilling and blast by:

- Monitoring effectiveness of current drilling practice (scanning of excavation profiles) using technology — S-M
- Using appropriate blast round designs (effective hole lengths and hole spacing) and explosives to minimise blast fracture propagation, for example, emulsion-type explosives — S

Eliminate the risk of people working under unsupported rock by:

- Reviewing current netting and bolting practices across the industry to customise them to the geotechnical conditions of individual mines using an enhanced MHSC areal support selection tool (enhanced areal support selection tool should consider industry leading practices) — S
- Implementing permanent area coverage in stoping widths < 1.2m (*Note: any obstacles that require research and development should be dealt with in recommendation 2*) — S-M

Improve underground visibility by:

- Documenting and disseminating a leading practice on workplace illumination to meet appropriate illumination standards applicable to general offices — S

2 RESEARCH AND DEVELOPMENT (R&D)

Invest R40m over five years in collaborative R&D on low-hanging fruit for FoG fatality elimination including, for example:

- Barring Technology that will assist with:
  - identifying loose rock — S-M
  - safely and effectively removing it — S-M
- Improved or optimised seismic hazard rating and warning systems, e.g., poor performance of short-term hazard assessment — M
- Systems and technology tools that allow real-time monitoring and proactive warning of instability in operations – initially site-based but later integrated mine-wide — S-M
- Support designs — M
- Implementing improved drilling accuracy by using jigs / rigs in conventional stoping panels — M
- Any challenges related to the implementation of any of these recommendations — S-M

3 SKILLS DEVELOPMENT

Invest R6 million over three years on:

- Updating of the learning material for the Chamber of Mines Strata Control Certificate and Rock Mechanics Certificate — S-M
- Short-course programmes (typically online) for the development and exposure of new and current rock engineering personnel — S-M
- Support efforts within mines to ensure: — S
  - coaching and mentoring of new and current rock engineering personnel using senior personnel, as a joint initiative between the RETC and SANIRE
  - knowledge transfer, technical capacitation, development and assessment, e.g., risk management
- The development and implementation of formal learning programmes and / or qualifications to improve the capabilities of production supervisors, mine overseers, and managers to supervise, manage and lead the elimination of FoG fatalities — S-M

4 POLICY ISSUES

Engage the Department of Mineral Resources and Energy through the Chief Inspector of Mines to request his intervention in fast tracking the:

- Promulgation of the revised Guideline for the Mandatory Code of Practice to address Geotechnical Risk with a view to implementation, developed in 2016 — S
- Finalisation of the review of Chapter 2 Regulations on Appointments, Duties & Responsibilities, which includes revised appointments for rock engineering personnel (the regulations will provide for, e.g., recognition of strata control officers to conduct underground audits thus enabling the rock engineers to focus on strategic / design responsibilities) — S

Adoption by mining companies of the SAMRASS forms that rock engineers previously developed to enable better quality FoG accident investigations for incorporation into the 'digitisation of safety data' project of the Minerals Council — S

5 BEHAVIOUR, CULTURE, OPERATIONAL DISCIPLINE

- Implement ways to reduce the mining cycle time to be long enough to implement the control measures to eliminate FoG fatalities effectively, for example, faster drills / faster transport to working places, etc., taking account of the relevant work done by the MMP. If measures that are reasonably practicable cannot be identified, planning should be adjusted accordingly — M

6 IMPLEMENTATION AND MONITORING

Leading implementation:

- Support an annual FoG Day of Learning hosted by AMMSA and SACMA (jointly / separately) in collaboration with the RETC, SANIRE, and other relevant structures to align members on the Elimination of FoG Fatalities Action Plan and to do a refresh on current leading practices such as the Triggered Action Response Plan (the associations could consider their own programme of action to support the implementation of the CEO-approved Elimination of FoG Fatalities Action Plan, including sharing of FoG leading practices at their regular meetings) — S
- Approve the use of consecutive fatal-free hours worked (normalised for any increase / decrease in number of employees) and leading indicators as identified measures of progress for the implementation of the Elimination of FoG Fatalities Action Plan — S
- Provide a progress report on the implementation of the Elimination of FOG Fatalities Action Plan by individual members on a quarterly basis to demonstrate progress, identify successes and challenges, and communicate progress to other stakeholders. The Minerals Council will use these reports to assess industry implementation — S

Key

- S — Short = 0-2 years
- M — Medium = 2-5 years
- S-M — Short to Medium = 0-5 years

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