MHSC

Mine Health and Safety Council

SUMMARY OF RESEARCH PROJECTS

April 2023 - March 2024

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ABOUT THE MHSC

The Mine Health and Safety Council (MHSC) is a national public entity established in terms of the amended Mine Health and Safety Act, No. 29 of 1996. As an entity, the MHSC comprises a tripartite board consisting of the State, Employers, and Organised Labour, with the Chief Inspector of Mines as the chairperson. The MHSC is mandated to advise the Minister of Mineral Resources and Energy on Occupational Health and Safety (OHS) issues within the South African Mining Industry (SAMI). Additionally, the MHSC is responsible for developing and implementing the OHS research programme, periodic review and development of mining OHS legislation, as well as dissemination of knowledge to improve the safety and health of mining employees. In 2014, OHS milestones were proposed by the tripartite stakeholders to accelerate the attainment of Zero Harm in the sector. To this end, the MHSC continues to strive for excellence in implementing research outcomes and disseminating knowledge and technology in the SAMI.

CENTRE OF EXCELLENCE

The Centre of Excellence (CoE) emerged from the Tripartite Occupational Health and Safety Leadership Summit of 2008, originating as a collaborative initiative among tripartite stakeholders. Its inception was formalized during the 2014 Summit, backed by clear directives from Stakeholder Principals and delineated milestones to ensure its operational effectiveness. Envisioned as a hub for Occupational Health and Safety (OHS) advancement within South African mines, the CoE was tasked with conducting OHS research, contributing to training and education initiatives, and facilitating the dissemination of research findings.

Aligned with the overarching goal of achieving "ZERO HARM" and ensuring the safe return of every mine worker each day, the CoE's establishment coincided with the MHSC's 20th anniversary. This milestone underscored a continued commitment to enhancing safety standards within the industry. Moreover, the CoE's objectives resonated with the National Development Plan (NDP), particularly Chapter 9, which emphasizes improving education, training, and innovation.

Since its full capacitation and operationalization in 2018, the CoE has pursued several key objectives:

- Conducting research and facilitating the implementation of research outcomes.
- Managing and conducting laboratory testing, including essential statutory tests for compliance.
- Offering assistance to the industry in occupational hygiene measurements and access to analytical laboratories for testing and measurements of occupational exposures.
- Providing health and safety-related education and training across various developmental levels, with a focus on enhancing the skills and knowledge of mineworkers.
- Establishing and maintaining an electronic library system to manage mine health and safety information, ensuring efficient knowledge management within the Council's mandated activities.
- Facilitating research capacity building and the enhancement of research equipment through collaborations with esteemed research centres such as the CSIR, NIOH, UP, and Wits.

Through these initiatives, the CoE continues to play a pivotal role in advancing occupational health and safety standards, fostering innovation, and contributing to the overarching mission of safeguarding the well-being of mine workers across South Africa.

OVERVIEW - MHSC RESEARCH

The MHSC has conducted over 400 research projects, categorised into nine (9) Research Thrust Areas, namely; Human Factors and Behavioural Safety, Falls of Ground (FOG), Rock Bursts (Seismicity), Transport and Machinery, Airborne Pollutants, Physical Hazards, Occupational Diseases and Special Projects. The classification of the research into these thrust areas is intended to assist the industry in addressing OHS challenges. This report provides a summary of research work completed by the MHSC over a one-year period, April 2023-March 2024. Full reports of completed research projects on the nine thrust areas are available on the MHSC website (www.mhsc.org.za).

SUMMARIES OF COMPLETED RESEARCH PROJECTS

Project Title:	**IS THE CURRENT CRYSTALLINE SILICA DUST EXPOSURE MEDICAL SURVEILLANCE SYSTEM IN THE SAMI COMPREHENSIVE TO MONITOR ALL ORGANS ADVERSE HEALTH OUTCOMES?**
Project Number:	**CoE 190605**
Research Agency:	**Mundele Business Consultancy**
Authors:	**Nyirenda T., Mhura D., Mamabolo M., Mhura M. and Mudzviti M.**
Date Completed:	**January 2022**

Background

Section 13.2 of the Mine Health and Safety Act (MHSA) 29 of 1996 requires mining employers to establish an ongoing medical surveillance system to detect, control, and prevent occupational diseases. Additional guidelines on medical surveillance for silica dust exposure are provided in Section 11.7 of the MHSA 29 of 1996. Currently, available medical surveillance systems for Respirable Crystalline Silica (RCS) dust exposure are focused on cardiorespiratory organs, as stipulated in the mandatory Code surveillance for monitoring dust in the South African Mining Industry (SAMI). A review of the literature and existing case studies of individuals exposed to RCS dust found an increasing risk of lung cancer, renal diseases, and systemic autoimmune diseases such as progressive multiple sclerosis in these individuals. For this reason, a research study was developed to assess existing RCS exposure regulations, standards, and practices in the SAMI. The usefulness of existing medical surveillance systems on RCS dust exposure within the mines was reported.

Aim and objectives of the study

This study aimed to assess the feasibility and reliability of medical surveillance systems for RCS dust exposure in the SAMI and elucidate other adverse health effects on employee health not stipulated in the existing mandatory Code of Practice (COP).

The specific objectives were outlined as follows:
To review the literature on all human organs affected by RCS dust exposure nationally and internationally.

Conclusion

The conclusion of the project highlights several key findings regarding the medical surveillance system for Respirable Crystalline Silica (RCS) dust exposure in the SAMI.

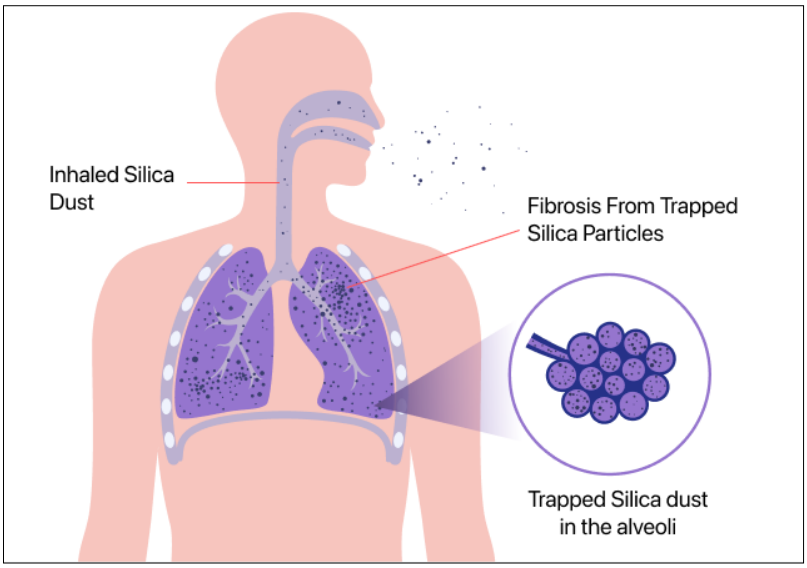

Figure 1: Silicosis developing in the lungs (ConsumerNotice.org, 2024).

The survey results revealed that while the current system is effective in monitoring and minimising the risk of RCS dust exposure, it primarily focuses on the respiratory system and does not adequately address other organs potentially affected by RCS dust exposure.

A gap analysis (Table 1) identified discrepancies between the existing mandatory COP for RCS dust exposure medical surveillance, survey results, and the literature base. While the COP effectively manages RCS dust exposure and has contributed to a decline in pneumoconiosis cases, it lacks comprehensive monitoring of organs beyond the respiratory system. Key gaps include the absence of monitoring for the cardiovascular, renal, and autoimmune systems, as well as limitations in non-invasive and invasive testing procedures.

Table 1: Summary of gaps – system of medical surveillance.

Gap Analysis – System of Medical Surveillance				
Variable	**Desired State**	**Current State**	**Identified Gaps**	**Proposed Actions**
The RCS Dust Exposure Medical Surveillance System in the SAMI	1. Medical Surveillance System in the SAMI 2. Consisting of Initial, Periodic and Exit Medical Examinations 3. A Mandatory Code of Practice in the SAMI	1. Medical Surveillance System is already in place 2. Consists of Initial, Periodic and Exit Medical Examinations 3. Mandatory Code of Practice is already in Place	No Gaps Identified	No Proposed Actions

Overall, the study concludes that while the current medical surveillance system effectively addresses minimum requirements, there are gaps in monitoring non-respiratory organs affected by RCS dust exposure. The findings underscore the need for comprehensive medical surveillance guidelines that encompass all organs potentially impacted by RCS dust exposure to ensure the health and safety of workers in the mining industry.

Recommendations

- The MHSC and its stakeholders to update Regulation 11.7 of the MHSA and the Mandatory COP for RCS dust exposure (DMRE 16/3/2/4-A1) to include examinations of Cardiovascular to detect cardiovascular diseases, renal examinations to detect CKD and ESRD, Autoimmune examinations to detect RA, SLE and multiple scleroderma

- Update of the Mandatory COP for RCS dust exposure (DMRE 16/3/2/4-A1) to include tissue biopsy, DLCO test, bronchoscopy, CT scans, sputum test, and skin test as part of medical surveillance to the existing cardiorespiratory tests as a procedure to enhance medical screening of pneumoconiosis.

ACCESS LINK TO THE FULL REPORT: CoE 190605 - Full Report

Project Title:	**DEVELOP A WELDING FUME SAMPLING STANDARD (STANDARD OPERATING PROCEDURE AND GUIDANCE NOTE) FOR THE SAMI.**
Project Number:	**CoE 190601**
Research Agency:	**Enterprises at the University of Pretoria**
Authors:	**Dekker J.J., Claassen N., Forbes P., Pistorius P. G. H., Pullen M., Schoeman J., Schoeman I., van Dyk T., van der Walt J., Preis E. P.**
Date Completed:	**September 2021**

Background

Welding fumes are a complex mixture of metallic oxides, fluorides, and silicates. The International Agency for Research on Cancer (IARC) has classified welding fumes and Ultraviolet radiation from welding as Group 1 carcinogens, with sufficient evidence of carcinogenicity in humans based on observational and experimental studies. The current research intended to guide the SAMI on methodology and provide best practices for monitoring and measurement of exposure to welding fumes to employees.

Aim and objectives of the study

The study aimed to develop a feasible and robust measurement methodology for assessing welding fumes exposure in the SAMI and to best practices and guidelines for monitoring and management of exposure.

The specific objectives for the projects were:

- To evaluate and compare different measurement technologies available to analyse media and the possibility to utilise sensor technology to determine welding fume exposure levels in the work environment.
- To establish a sampling and sample analysis methodology for welding fumes, considering traditional approaches and modern developments.
- To test the welding fume sampling and sample analysis methodology's practicality and accuracy for the SAMI in the working environment.
- To develop an SOP detailing sampling and analysis methodology for welding fumes for the SAMI, considering traditional approaches and modern developments.

Conclusion

The Standard Operating Procedure (SOP) developed through this research describes exposure assessments methods, sample analysis procedures and control measures in the SAMI for welding fumes. It is therefore, envisaged that best practices in terms of ventilation, use and maintenance of personal protection equipment to control exposure to welding fumes in the SAMI will assist occupational hygienist and engineers to implement approaches and procedures to reduce welding fumes exposure levels.

Recommendations

Further studies expand on testing the proposed methodologies as outlined in the study SOP to improve the effectiveness and adaption of the SOP for use in the SAMI.

ACCESS LINK TO THE FULL REPORT: **CoE 190601 - Full Report**

Project Title:	**DEVELOP GUIDELINES FOR RECOGNITION OF PRIOR LEARNING AND TRAINING OF OCCUPATIONAL HEALTH AND SAFETY REPRESENTATIVES AND UNION SHOP STEWARDS IN THE SAMI.**
Project Number:	**CoE 180903**
Research Agency:	**The University of the Witwatersrand**
Authors:	**Coulson N. and Hermanus M.**
Date Completed:	**October 2022**

Background

Shop stewards appointed under the Labour Relations Act No. 66 of 1995 as amended, routinely sit on the mine health and safety committee and support workers concerning claims for compensation, the completion of section 11(5) investigations, and all issues arising related to fitness for work testing and incapacitation. Presently there is no training that supports shop stewards in their OHS role. These and other difficulties have contributed to questions being asked about the effectiveness of training for OHS representatives. The present skills program to train OHS representatives is the Skills Programme, MQA/SP/0120/10, Health & Safety Environment for OHS representatives. Registered at the NQF at level 2 (equivalent to Grade 10).

Full-time OHS representatives feel they are unable to use their experience of OHS to advance their careers as health and safety practitioners once their term of office as worker representatives ends. The MHSC 2014 study identified both systemic and specific difficulties that needed to be addressed, for the training experience of worker representatives to be more effective. In 2019, the Wits Mining Institute was contracted to take the 2014 MHSC study further, by considering the role of Recognition of Prior Learning (RPL) in the career advancement of representatives and through the development of a more comprehensive training framework.

Aim and objectives of the study

The study aimed to contribute to the development of OHS training programs of OHS representatives & union shop stewards that would empower employees to actively contribute to maintaining a safe and healthy work environment in SAMI

The specific objectives for the project were:

- Conduct a literature review to inform the development of a training needs assessment tool tailored to OHS representatives and union shop stewards in the SAMI, covering Gold, Platinum, and Coal sectors.
- Develop a customised training needs assessment tool specifically designed for OHS representatives and union shop stewards in the SAMI, considering the unique requirements of each sector.
- Create an appropriate model or process for Recognition of Prior Learning (RPL) tailored to OHS representatives and union shop stewards in the SAMI, facilitating the recognition and accreditation of existing skills and knowledge.
- Execute the OHS training needs assessment at selected mines within the SAMI, gathering data to identify specific training gaps and needs.
- Analyse the findings from the OHS training needs assessment and compile a draft report, highlighting identified gaps and needs in OHS training.
- Collaborate with the Mining Qualification Authority (MQA) to qualify different OHS training levels into Unit Standards and align them with the National Qualification Framework, ensuring consistency and standardization across training programs.
- Develop OHS training guidelines for OHS representatives and union shop stewards in the SAMI based on the findings of the needs assessment, providing a framework for effective training delivery and implementation.

Conclusion

The conclusion of the study underscores the critical need for the proper implementation of Occupational Health and Safety (OHS) requirements outlined in the Mine Health and Safety Act (MHSA), aligning with the principles of the International Labour Organization (ILO) Convention 176 and global best practices. Despite these foundational standards, it's evident that current practices within the South African Mining Industry (SAMI) fall short and necessitate re-evaluation and revision to meet established regulatory and international benchmarks.

Recommendations

Recommendations include expanding and enhancing the formal training of OHS representatives and shop stewards, with a focus on developing both part-time and full-time qualifications through the QCTO to encompass their entire roles in workplace OHS. Additionally, establishing clear pathways for career advancement is crucial to enable OHS representatives to progress into roles such as mine health and safety officer.

Furthermore, the establishment of appropriate RPL processes can facilitate access to non-medical occupations for OHS representatives and shop stewards. Addressing the lack of focus on the work of worker representatives in the SAMI necessitates the establishment of a dedicated working group at the MHSC. This group would be responsible for ensuring adequate research, policy development, training, and delivery to support an effective system of worker representation.

ACCESS THE FULL REPORT HERE: CoE 180903 - Full Report

Project Title:	**STUDY ON GOOD LEDGING PRACTICES AND THE DEVELOPMENT OF VIRTUAL VIDEO TRAINING MATERIAL BASED ON GOOD LEDGING PRACTICES**
Project Number:	**CoE 180201**
Research Agency:	**Enterprises at the University of Pretoria**
Authors:	**van der Walt J., Philo K., Preis E., Meyer B., Jacobs J., de Graaf W., Malan F. and Delport J.**
Date Completed:	**July 2022**

Background

Ledging can be defined as the process of establishing the initial footwall ledge for a stope by taking the first cut from the original raise. This process ensures the formation of a suitably supported, robust, and competent center gully for the life of the raiseline being mined (Minerals Council of South Africa, 2018). However, the ledging process is associated with several inherent risks and hazards due to the span of unsupported hanging wall exposed before the installation of permanent support. Ledging is an essential phase of the mining process as it often determines the stability and longevity of the raise or center gully (SIMRAC, 2001).

This project was initiated by the Mine Health and Safety Council (MHSC) to address concerns about the current shortfalls in ledging-specific training content in the South African Mining Industry (SAMI) and to improve the safety and productivity of the ledging process. The project aimed to review ledging best practices implemented in the industry and develop a guideline document in consultation with industry experts and practitioners.

Aim and objectives of the study

The study aimed to review the best ledging practices in the SAMI and develop guidelines for comprehensive ledging training programs for mining operations.

The specific objectives for the projects were:

- To identify, review, and analyse good practices for ledging in the SAMI.
- To identify and address information gaps based on an assessment tool developed during the project.
- To propose good ledging practices and develop a Guidance Document.
- To develop a proposed scope and plan, as a separate proposal, for the development of animated training material based on the identified leading ledging practices. (Note that this project concludes with a proposal for the next phase, which will involve the

development of training material. Therefore, no material will be developed in this phase).

Conclusion

The conclusion of the project culminated in the development of a comprehensive ledging guidance document, derived from industry best practices and expert knowledge. This document serves as a valuable resource for mining operations in the South African Mining Industry (SAMI), offering guidelines tailored to varying geological and geotechnical conditions. It is emphasized that while the guidance document is not intended to be a prescriptive manual, it provides essential considerations for each phase of the ledging operation.

Key components of the guidance document include:

- A ledging-selection flow diagram (Figure 1) to aid in selecting the most suitable ledging method for different mining environments.

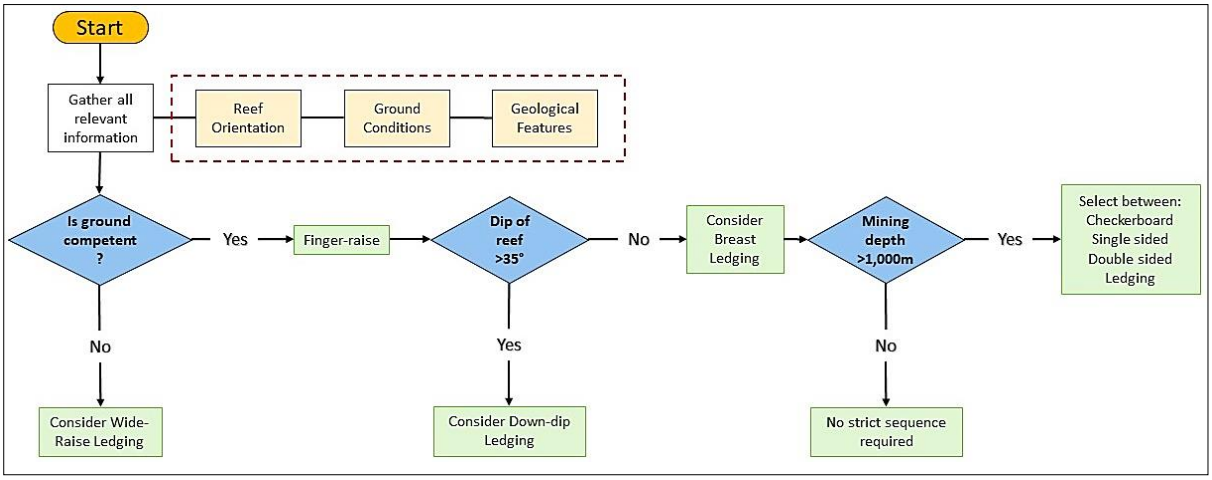

Figure 1: Ledging method selection flow diagram.

- Emphasis on the importance of an ore reserve management plan and a development service strategy (DSS) plan as foundational elements for ledging and future stoping activities.
- Pre-ledging (Figure 2) and post-ledging flow (Figure 3) diagrams, accompanied by key considerations and guidelines for down- and up-dip ledging, breast and wide-raise ledging, as well as overstoping.

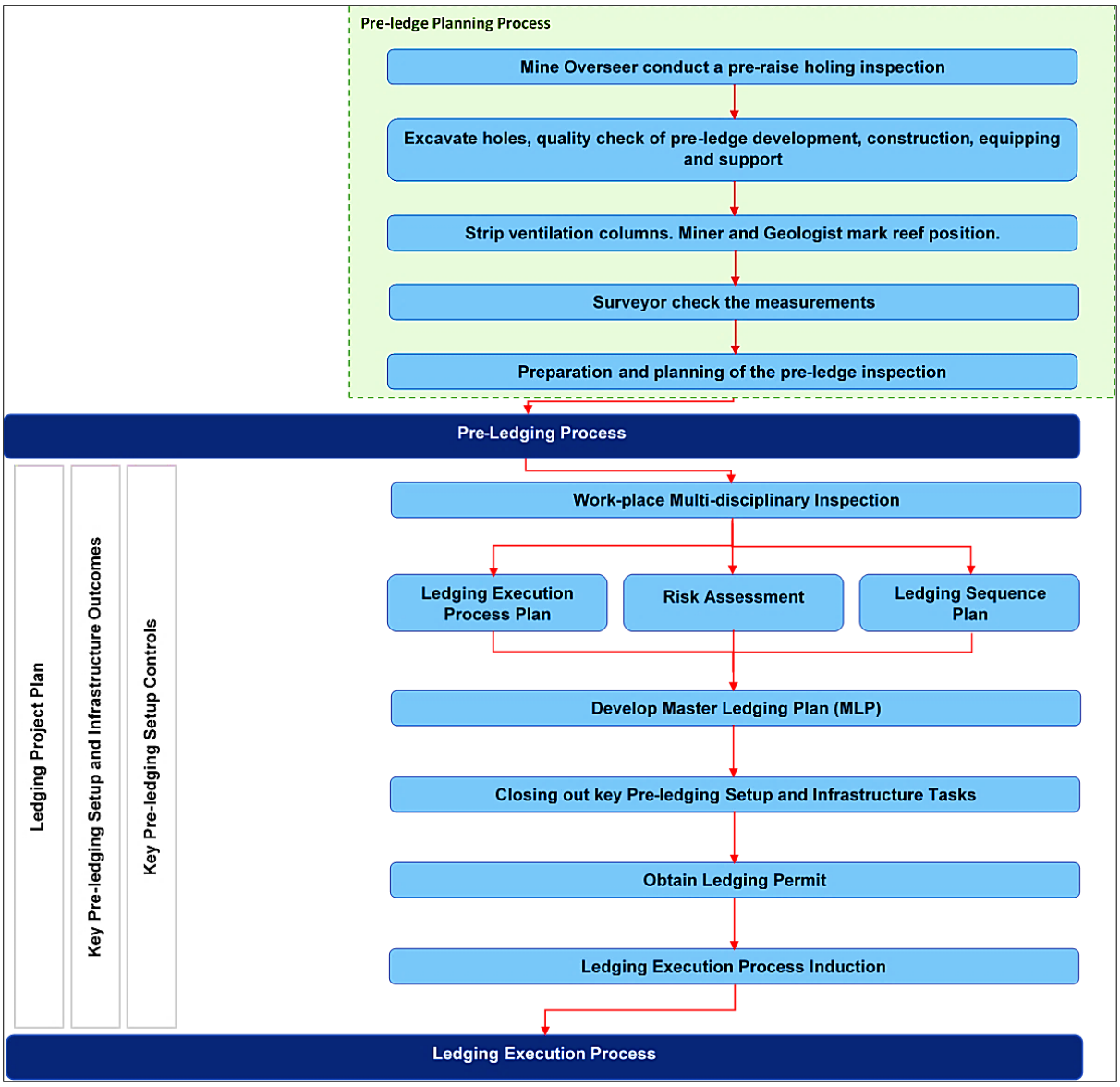

Figure 2: Pre-ledging process flow diagram.

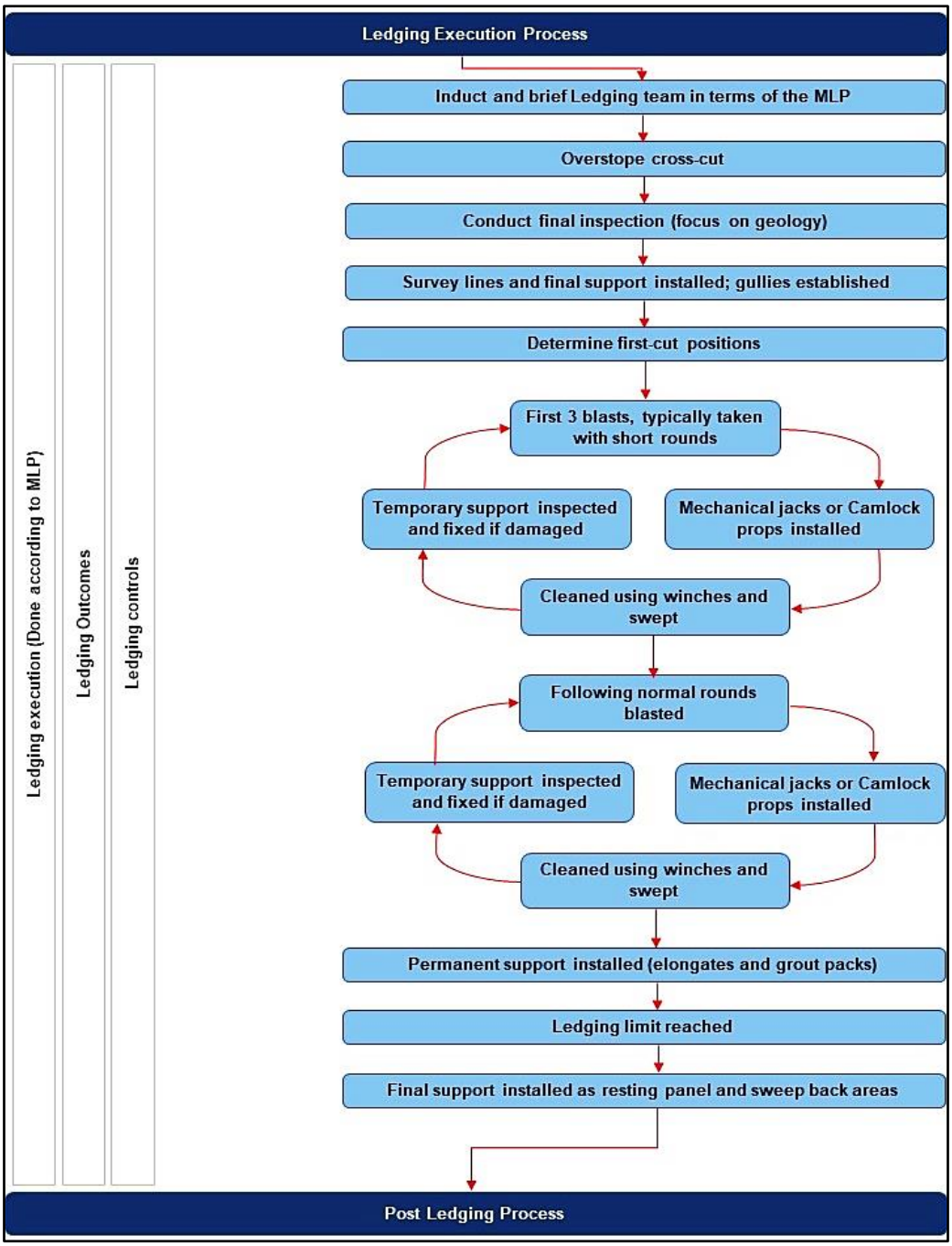

Figure 3: Illustration of the ledging process up to the post ledging process.

- Guidelines for post-ledging operations, including enabling and supporting factors for successful ledging operations.

Recommendations

Moving forward, it is recommended that the guidance document be utilised during the adoption process of the Mining Occupational Safety and Health (MOSH) leading practices timeline within the SAMI. Moreover, the document should serve as the basis for developing ledging-

specific training materials, utilising animated educational materials such as 2D and 3D videos, and mock-ups to simulate the working environment. Overall, the project successfully achieved its objective of developing a practical and informative resource to enhance ledging practices in the SAMI.

ACCESS THE FULL REPORT HERE: CoE 180201

Project Title:	**UPDATE THE SOUTH AFRICAN MINING STRESS MEASUREMENT DATABASE**
Project Number:	**CoE 190202**
Research Agency:	**BKM Engineering**
Authors:	**BKM Engineering**
Date Completed:	**September 2023**

Background

The MHSC conducted a research project in 2014 to update the South African stress measurement database. The web-based application currently hosted on the MHSC website provides an enhanced application for use in historical stress measurement data searching and currently contains more than 400 stress measurement data records including several from South African mines. To achieve the objectives of the study, an overview of technologies and methodologies for in-situ stress measurements in deep and high-stress South African mines such as Diametrical Core Deformation Analysis (DCDA), Deformation Rate Analysis (DRA), and compact conical-ended borehole overscoring (BX-CCBO) were reviewed. In addition, a review of the GAP 511 and SIM 160202 projects was done, as well as a review of available published stress measurement data records.

Aim and objectives of the study

This study aimed to update the South African mining stress measurements database and improve the application of the database for rock engineers, mining engineers, technical specialists, seismologists, and researchers.

The specific objectives for the projects were:

- To enable users to search and filter relevant stress measurement data.
- To enable users to update, download and maintain stress measurement data.

Conclusion

The stress measurement database with functionalities (Figures 1 to 4) that would allow stakeholders to retrieve, enter, and download stress data was developed.

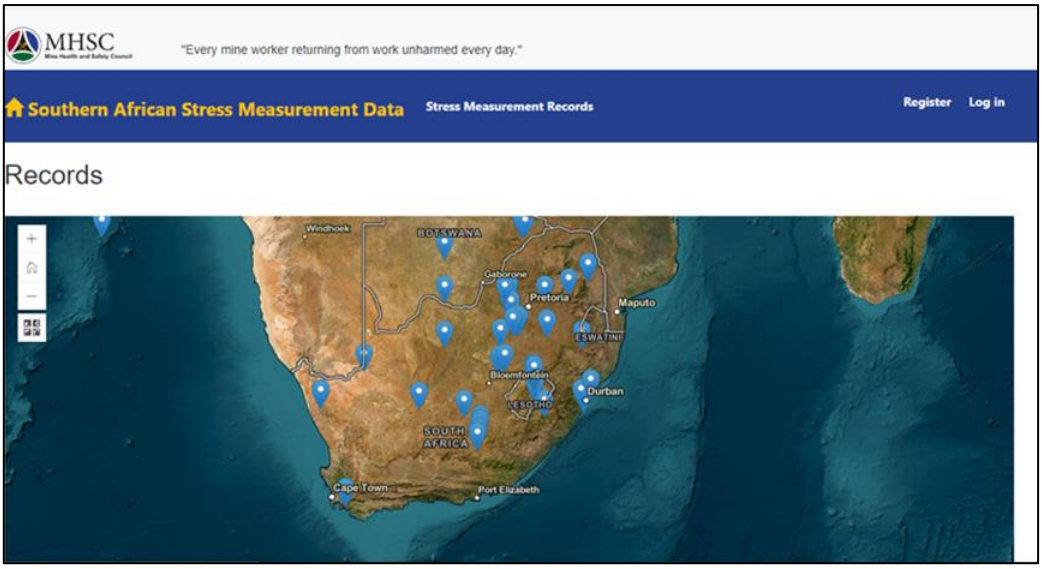

Figure 1: Homepage for the stress measurement record system.

Figure 2: The homepage for the stress measurement record includes a search bar, add condition, export, and delete column options.

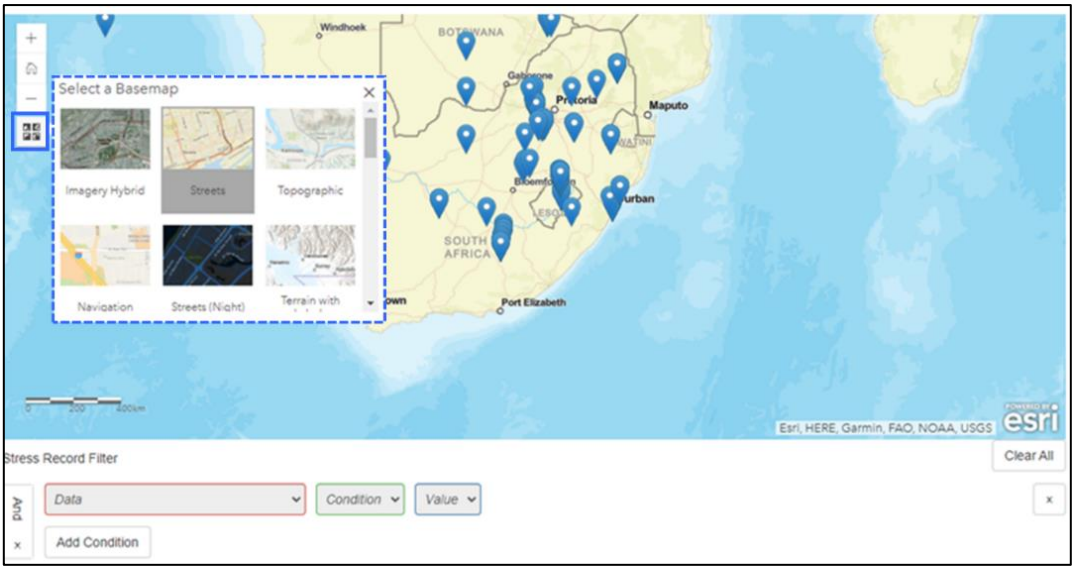

Figure 3: Basemap display options.

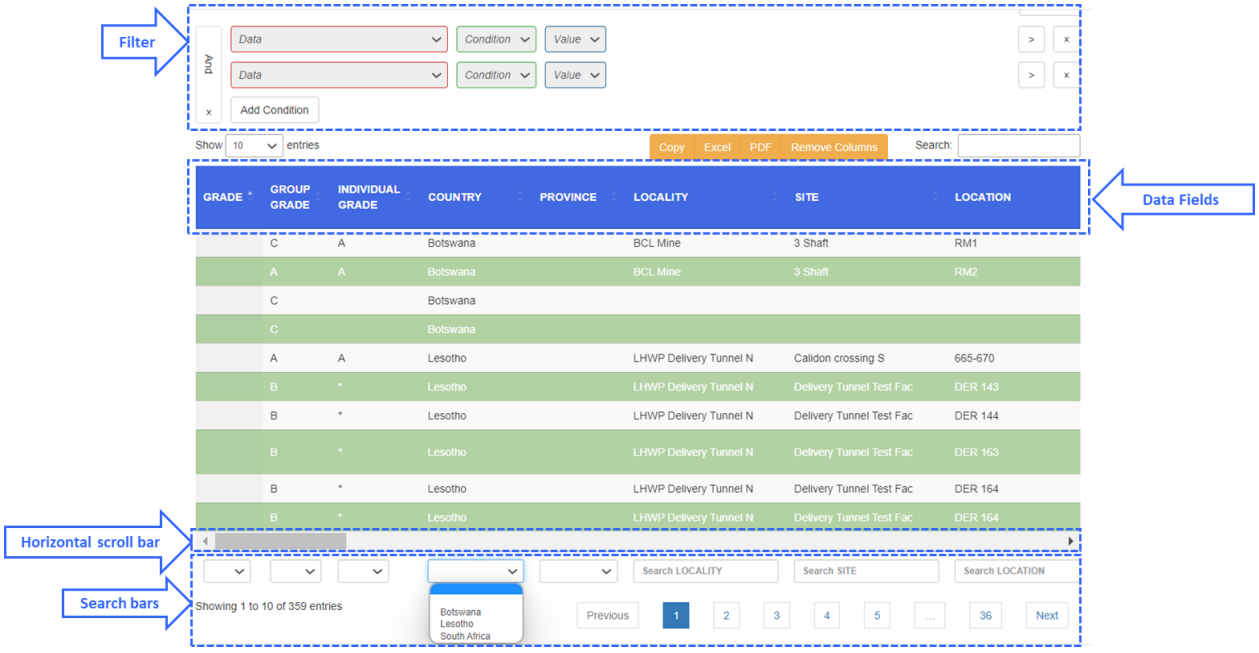

Figure 4: Stress measurement record system homepage display, showing detailed functionality, including filters and other available functions.

Recommendations

Based on the outcome of the study, the following recommendations were made:

- It is recommended that the database be hosted on the MHSC website as it will provide centralised access to critical stress measurement data for stakeholders in the South African mining industry.

ACCESS THE FULL REPORT HERE: CoE 190202

Project Title:	**ASSESS THE FEASIBILITY OF UTILISING EXHALED BREATH SCREENING AS AN ACCURATE AND RELIABLE ALTERNATIVE TO BLOOD SAMPLE ANALYSIS AS A METHOD TO INDICATE OVER-EXPOSURE TO CARBON MONOXIDE (CO)**
Project Number:	**CoE 180603**
Research Agency:	**Enterprises at the University of Pretoria**
Authors:	**Claassen N., Pretorius C. J., Joubert R., van der Walt J., Schoeman J., Pullen M., Dekker J. J., de Beer C. and Steenkamp L.**
Date Completed:	**September 2023**

Background

Chapter 23 of the MHSA (Regulation 23.1(d)) requires an employer to report inhalation of fumes or poisonous gas to the Principal Inspector of Mines. Upon exposure to carbon monoxide (CO), an employee is removed from the workplace, where a blood sample is tested for carboxyhaemoglobin (COHb) levels. There are available CO breath analysers for use in other environments; nonetheless, uncertainties exist about the accuracy and reliability of these instruments as an alternative to blood sample analysis in the SAMI. The research conducted assessed the use of CO breath analysers as a non-invasive, immediate measurement tool for COHb during potential overexposure to CO.

Aim and objectives of the study

The study aimed to assess the feasibility of utilising exhaled breath screening as an accurate and reliable alternative to blood sample analysis as a method to indicate overexposure to carbon monoxide (CO).

The objectives of the research were outlined as follows:

- To investigate carbon monoxide (CO) exposure limits, biological exposure indices (BEIs), and CO testing methodologies in South Africa and internationally.
- To define a “gassing case” to enable classification of the requirements in Chapter 23 of the MHSA.
- To outline anticipated exposure levels in underground mines and recommended actions for exposed employees.
- To investigate the accuracy and reliability of existing CO breath analysers and propose areas of improvement for use in the SAMI.
- To develop a guidance note and an SOP for exhaled breath screening and alternative screening methods for CO exposure.

Conclusion

The project successfully achieved its intent, resulting in the development of a guidance note for implementing exhaled breath screening as an accurate and reliable alternative to venous blood sample analysis. Exhaled breath screening can serve as an initial screening tool for potential CO "gassing cases"; however, once a case is confirmed, obtaining a venous blood sample is still necessary, as this is the only medically accepted test to verify a confirmed CO gassing case. The guidance note establishes best practices for implementing a fast, accurate, and reliable methodology to screen for CO over-exposures in exhaled breath during events of over-exposure.

The guidance note contains the following key objectives for the implementation of exhaled breath screening as an accurate and reliable alternative to venous blood sample analysis:

- The objective of a CO exhaled breath screening programme.
- The components of a CO exhaled breath screening programme, as summarised in **Error! Reference source not found.**.

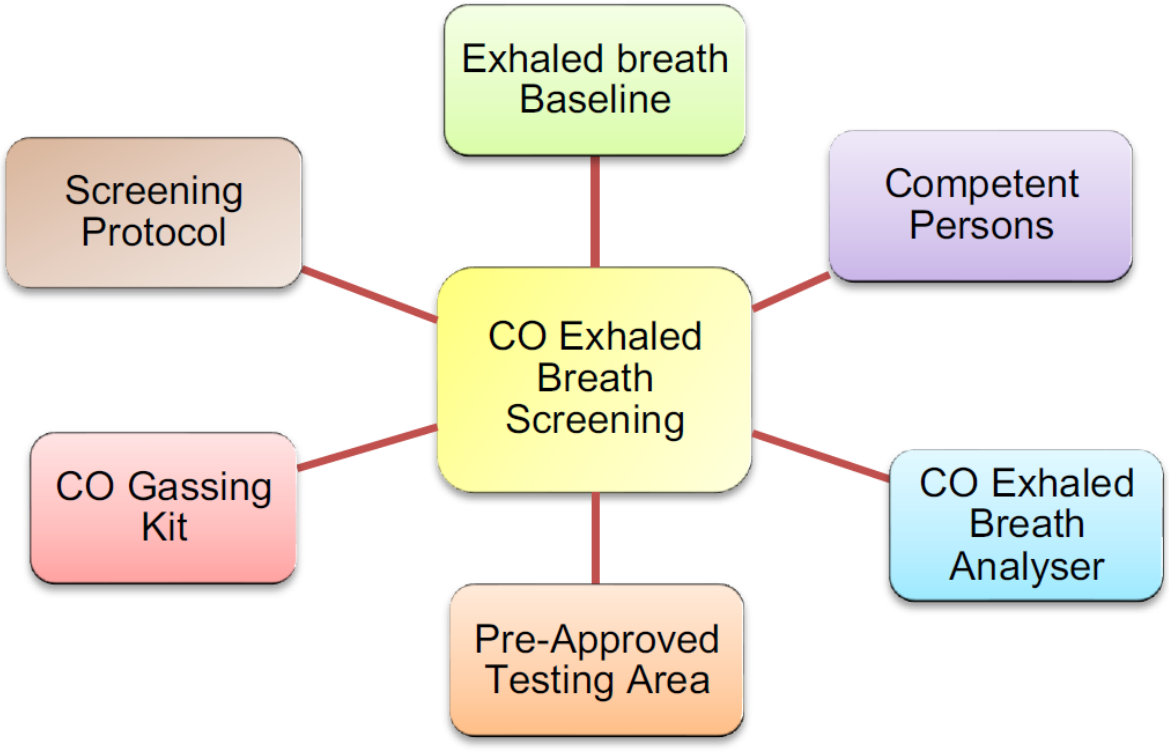

Figure 1: Components of a CO exhaled breath screening programme.

Recommendations

Based on the outcome of the study, the following recommendations were made:

- Mines should define and refine the associated categories (suspected, probable, and confirmed cases), during implementation.
- Incorporate aspects outlined in the Guidance Note and SOP into existing COPs, emergency and risk-based care programs, and protocols.
- Hold interactive workshops during the development of Guidance Notes and SOPs to ensure that feedback is obtained from a broad spectrum of stakeholders.

ACCESS THE FULL REPORT HERE: CoE 180603

Project Title:	**WHAT FINANCIAL MODEL, REQUIREMENTS AND RESOURCES CAN BE USED IN DEVELOPING AN ANALYTICAL LABORATORY FOR VERIFYING THE EXPOSURE TO HAZARDOUS OCCUPATIONAL AIRBORNE POLLUTANTS BY MINE EMPLOYEES?**
Project Number:	**CoE 190604**
Research Agency:	**Enterprises at the University of Pretoria**
Authors:	**Preis E., Pretorius C., Forbes P., van der Walt J.**
Date Completed:	**November 2022**

Background

A project was undertaken at the Mine Health and Safety Council (MHSC) assessing the business model and financial requirements to establish the analytical reference laboratory for verification of hazardous occupational airborne pollutants reported by mines. The purpose of the analytical laboratory would be to receive samples from sites, analyse these samples for various airborne pollutants that are reportable to the DMRE, and report the results. In addition, the analytical laboratory would verify analysis results produced by other South African laboratories. For the sustainability of the established facility, the research performed a SWOT analysis based on the proposed business model, operational model, and financial model for the analytical reference laboratory to be initiated.

Aim of the study

The study aimed to propose a business model, an operating model, and a corresponding financial model for an analytical reference laboratory to be established at the Kloppersbos facility.

Conclusion

The research provided clear guidance on requirements for developing a verification laboratory in terms of facilities, human resources, instruments, and methods. The study concluded that the only feasible financial model for the proposed Kloppersbos Analytical Laboratory (KAL) is one where its sustainability does not hinge on its ability to generate profits. This would therefore require a fully funded model, where a third party provides the required capital budget as well as the operational budget. One of the key challenges identified by the KAL would be the number of required analyses that the laboratory would need to do in a year. The challenge was that – at most – the laboratory would verify 15% of all samples reported to the DMRE annually (approximately 15,000), which equates to around 2 250 analyses per annum.

Recommendations

Based on the outcome of the study, the following recommendations were made:

- A comprehensive Chain of Custody be developed and sample information be captured electronically.
- About 10% of samples that are used for the DMRE reporting should be sent to KAL for verification.
- A pre-weighed, blank filter membrane and reference filter be sent to the mine for verification purposes using XRD and/or FTIR, ICO-MS as a blank reference.
- Uncertainty and variability measurement should be taken into account.
- A suitable statistical analysis test be used for comparison of results.
- Data capturing and reporting be done on a web-based platform and/or database, similar to the Milestone Reporting Portal.
- A quality assurance system for accreditation of analytical laboratories such as the South African National Standard (SANS) 17025 should be implemented to ensure that accurate, reliable, and valid results are consistently reported.
- The SABS T146 SC2 be applied to increase the validity and quality of analysed samples.

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MHSC

Mine Health and Safety Council

EVERY MINEWORKER RETURNING FROM WORK UNHARMED EVERY DAY.

"ZERO HARM IN OUR LIFETIME"