INTERNATIONAL SOCIETY OF ENVIRONMENTAL ENCLOSURE ENGINEERS

August 11, 2023
Christopher J. Williamson
Assistant Secretary of Labor for Mine Safety and Health
Mine Safety and Health Administration
United States Department of Labor

ISEEE's Recommendations on MSHA's Proposed Rule on Exposure to Respirable Crystalline Silica
Agency/Docket Numbers: Docket No. MSHA-2023-0001
RIN: 1219-AB36

Dear Assistant Secretary Williamson:

The International Society of Environmental Enclosure Engineers (ISEEE) is an association of professional engineers, researchers, manufacturing engineers, industrial hygienists and related stakeholders dedicated to engineering particulate exposures out of operator enclosures in mining environments. We are pleased to provide feedback on the proposed rule on miner exposure to respirable crystalline silica. Many of our members have been involved in the development of standards for SAE and ISO specific to operator enclosure air quality and it is from this vantage point we share our comments.

Summary

The presence of silica in mining is ubiquitous. ISEEE believes that operator exposures to silica are preventable and, therefore, every action should be taken to protect machine operators from respirable particulates in the design, retrofit and manufacture of mining machines. Work by NIOSH specifically, PMRD, has produced valuable research, which has produced opportunities to greatly expand the protections afforded miners working in enclosed cabs.

ISEEE recognizes the importance of applying state of the art and best practices to address silica exposures for all miners. ISEEE, therefore, supports the effort being made by MSHA to recognize the advancements in science and technology to improve the regulation designed to protect our nation's miners. ISEEE recognizes the importance of consensus standards in the development of regulation. When industry develops standards which promote the common good and advance the goals of health and safety regulation, there is a unique symmetry which creates industry support for regulations which include such standards.

The current MSHA regulation is positioned to take advantage of an industry standard which addresses operator enclosure air quality in mining machines. ISO 23875:2021 Mining - Air quality control systems for operator enclosures - Performance requirements and test methods, which has been adopted as a national standard in Australia, Sweden, the EU, and Colombia SA, addresses the specific issues raised in the proposed rule.

Proposed action level and engineering and administrative controls

MSHA requests comments on the proposed action level. Stakeholders should provide specific information and data in support of or against a proposed action level. Stakeholders should include a discussion of how the use of a proposed action level would impact their mines, including the cost of monitoring respirable crystalline silica above the proposed action level, and other relevant information. Please provide supporting information.

MSHA is proposing a PEL of 50 µg/m^3 and an action level of 25 µg/m^3 for respirable crystalline silica exposure. Which proposed requirements should be triggered by exposure at, above, or below the proposed action level? Please provide supporting information.

The response to the question pertains to the application of the proposed PEL and action level to operator enclosure air quality.

The concern for the reduction of the PEL rests on whether the PEL can be technologically and economically achieved. As it relates to operator enclosure air quality, both the proposed PEL and the action level of 25 ug/m3 are both technologically and economically achievable.

Prior to the publication of ISO 23875 in February of 2021, the common practice was to rely on local machine dealers and aftermarket retrofitters to apply locally determined engineering controls. However, this approach has proven ineffective as a means to exposure reduction. Under previous cab manufacturing design standards (ISO 10263) operator enclosures were not designed to protect operators from respirable particulates.

To address respirable particulate exposure in mining machines, ISO TC-82 Mining created WG9 – Operator Enclosures, to develop a standard that addresses operator air quality over the lifecycle of the machine. Subject matter expert stakeholders were included in the standard writing process to ensure the inclusion of critical perspectives. Unlike previous committees focused on HVAC and ventilation performance, WG9 addressed operator air quality (respirable particulate concentration in the operator enclosure). The working group comprised representatives from ten mining countries, including engineering experts in HVAC and operator cabs, industrial hygienists from major mining companies, and specialists in operator enclosure air quality testing.

The results of the committee's work were published by ISO on February 22, 2021, with an amendment released in June 2022. The standard, ISO 23875:2021 Mining - Air quality control systems for operator enclosures - Performance requirements and test methods. ISO 23875 is technologically achievable, economically feasible, and has gained recognition as the standardized approach for engineering, performance testing, and maintenance of operator enclosures. It offers flexibility and innovation while emphasizing air quality performance throughout the machine's lifespan.

The proposed PEL and action level align perfectly with ISO 23875. ISO 23875 ensures that dust concentrations, including RCS, are maintained below the proposed MSHA action level of 25 µg/m^3. The industry has embraced the standard, with mining companies like Rio Tinto adopting it as their global machine specification. and others retrofitting machines for compliance. Pilot programs and successful implementations have already taken place, demonstrating industry recognition of the need for a standardized approach to mitigate RCS overexposure. In July of 2021, Lehigh Hansen (AKA Heidelberg Materials) submitted their pilot of a Caterpillar 775G Haul Truck, retrofitted under ISO 23875, for the 2021 NIOSH Mine Safety Technology Innovation Award for the stone, sand, & gravel industry sector, which they won with this submittal.

The implementation process involves raising awareness of the standard throughout the mining industry. Mining machine manufacturers, retrofit companies, and component suppliers have already invested in compliance programs and are preparing to meet the demand generated by an MSHA regulation.

The proposed rule provides for a 120-day implementation period after the publication of the rule in the Federal Register.

Queensland Australia implemented a similar rule (RS20), which requires all machines within Queensland, in the mining sector, to come into compliance within a four-year period. The implementation segregated the risks by identifying the machine types that operate in the highest exposure environments i.e., haul trucks, requiring them to be brought up to standard within the first year. The second year they moved to the next classification of machine(s) on the priority list with the end goal of all machine types, with a known risk, fitted up within a four-year period. This phased approach allowed the market to catch up to the demand. Within the first year the infrastructure required to support a large volume of retrofit activity was established simplifying the task for the following years.

Regarding exposures exceeding the action level of 25 $\mu g/m^3$, the recommended course of action is to inspect the cab in accordance with the requirements outlined in ISO 23875:2021. Following the instructions provided in the standard, repairs should be carried out, and subsequent performance testing, as prescribed by ISO 23875, conducted to verify the cab's performance. Compliance with ISO 23875 results in the maintenance of total respirable dust levels below the action level threshold of 25 $\mu g/m^3$. A cab that has obtained a certification of compliance with ISO 23875 has demonstrated its ability to operate below the action level. If it fails to do so, servicing is required. ISO 23875 includes a comprehensive maintenance manual, which encompasses templates for interim inspections of the cab's air quality system, maintenance procedures, and performance testing to ensure compliance. Notably, ISO 23875 was designed to adhere to an action level set below 25 $\mu g/m^3$.

MSHA requests comments on the proposed requirement that mine operators must install, use, and maintain feasible engineering and administrative controls to keep miners' exposures to respirable crystalline silica below the proposed PEL. Please provide supporting information.

ISO 23875, in line with the proposed regulation's objective, addresses the procedures and techniques for designing, installing, testing, and documenting the air quality performance in an operator enclosure. This standard, ISO 23875:2021, has been widely adopted by major mining companies as their global operator cab specification, by countries as their national standard, and by the European Union as EN ISO 23875:2022. Over the past two years, it has been proven to be both practical and cost-effective to implement. Importantly, the standard does not hinder innovation in technologies that can further reduce implementation costs. Its primary focus is on ensuring operator protection, which is quantified through performance requirements and testing. Compliance with air quality regulations at the 25 $\mu g/m^3$ threshold is the desired outcome in all cases. To be certified as compliant, a cab must produce test results demonstrating compliance with the dust concentration requirement (less than 25 $\mu g/m^3$), with the intake air requirement, and with the pressurization requirement. The cost of achieving compliance with ISO 23875 varies depending on the complexity of the machine design, but on average, it falls below $10,000 for retrofitting and can be even lower when incorporated into original equipment. As original equipment manufacturers adopt a single cab design that meets ISO 23875, further cost reductions are expected, leading to economies of production and lower prices. ISO 23875 also provides a maintenance regime that standardizes maintenance practices and service parts, aiming to reduce the overall

cost of machine ownership. The greater a site's compliance with the standard, the greater the economic benefit. Economies of scale are realized when cabs are standardized, and a single design can be mass-produced. Machine manufacturers who implement ISO 23875 compliant systems from the start allow for the lowest initial and ongoing maintenance costs for the mine. Regardless of whether it is an OEM or retrofit installation, an ISO 23875 compliant cab requires the same documentation and performance requirements.

Question 17

MSHA requests comments and information from stakeholders concerning the proposed approaches to monitoring exposures, and other approaches to accurately monitor miner exposure to respirable crystalline silica in MNM and coal mines. Please provide supporting information and data.

Recommend using a single respirable dust sample for the metal/nonmetal industry to establish a standard for both nuisance dust and respirable crystalline silica, similar to the coal industry's approach. This method enhances miners' health protection for general mine dust and allows subsequent analysis for crystalline silica and compliance with action and exposure limits (25µg and 50µg) when necessary. Unlike the proposed dual sampling process, this streamlined approach ensures more effective compliance measurement for metal/nonmetal miners.

Question 21

MSHA is proposing a requirement that mine operators qualitatively evaluate every 6 months any changes in production, processes, engineering controls, personnel, administrative controls, or other factors, beginning 18 months after the effective date. MSHA requests comments on the timing of the proposed semi-annual evaluation requirements, and in particular, whether miners would possibly be exposed unnecessarily to respirable crystalline silica levels above the PEL due to the gap between the effective date and the proposed requirements. Please provide supporting information.

The potential for unnecessary exposure is 100% when an arbitrary waiting period is implemented. The mining material changes constantly, and impurities and varying percentages of respirable crystalline silica constantly change within the ore material. Beyond the ore being mined, mining takes place in a constantly changing environment, influenced by factors such as the mining process itself, site exploration and site development, weather conditions, machine activities, wear and tear, and maintenance. These factors collectively create a dynamic situation that can lead to overexposure of miners. To prevent such unnecessary exposures caused by these ever-changing conditions, it is crucial to regularly reevaluate and address any deficiencies across all aspects of the mine site. Dust-related activities are an inherent part of mining and cannot be exempted. Change is an integral and routine aspect of daily operations on a mine site.

Question 23

MSHA is proposing that mine operators would not be required to conduct periodic sampling if the baseline sampling result, together with another sampling result or objective data, as defined in proposed § 60.2, confirms miners' exposures are below the proposed action level. MSHA seeks comments on this proposal. Please provide supporting information and data.

Baseline samples are relevant when the mine environment is static. An example would be an office on the mine site located away from mining operations. However, research done by PMRD using a camera and dust monitor mounted on the helmet of an operator found that the highest levels of exposure were experienced in the site

lunchroom. Simliarly, assaying operations which are generally not in immediate proximity to the mining operation have also been found to have very high exposure levels due to the lack of adequate filtration within the assaying facilities. Other examples may be cited. If MSHA desires to relieve the mine operator from the duty to conduct periodic sampling, it should do so in context, identifying the specific types of mine operations etc. where this exemption could apply and only when sampling is done by an objective third party unrelated to the mine. As stated in the question, the exemption could be applied to any location, work, or function in the mine. An exemption of this kind would result in unnecessary exposures due to the dynamic nature of mining. Additional comments which amplify this response are found in the comments on Questions 21 and 24.

Question 24

MSHA is proposing that mine operators conduct periodic sampling within 3 months where the most recent sampling indicates miner exposures are at or above the proposed action level but at or below the proposed PEL and continue to sample within 3 months of the previous sampling until two consecutive samplings indicate that miner exposures are below the action level. MSHA solicits comments on the proposed frequency for periodic sampling, including whether the consecutive samples should be at least 7 days apart. Please provide supporting information and data.

The response to question 21 highlights the dynamic nature of mining operations and the potential for miner exposures. However, the reasoning presented in question 24 assumes a static state in mining where exposure risks are consistently reduced or eliminated. While it is true that miners working in administrative offices located far from active mining may experience lower than permissible exposure limit (PEL) levels, the logic in question 24 should clearly specify the specific job types and factors that have contributed to these reduced exposure levels, qualifying them for exemption from further testing.

To ensure accuracy, consecutive samplings can be selectively conducted during seasons with snow or rain when exposures are naturally mitigated. It is crucial to define the sampling process more precisely, considering the timing of sampling to align with periods when dust exposures are typical for that specific season at the site. A determination needs to be made as to the appropriate environmental conditions that would disqualify a day for sampling. Days with naturally low dust conditions should be excluded as potential sampling days. Failing to address this issue could lead to sampling being conducted only during the most favorable times, with the aim of achieving acceptable samples over several months and avoiding further sampling altogether. Such incentives would be detrimental to the well-being of miners and counterproductive to the intent of the proposed rule.

The health of the nation’s miners depends on realistic and unbiased sampling. Sampling should be done by disinterested third parties and not by the MSHA regulated mining company.

Question 25

MSHA is proposing that mine operators may discontinue periodic sampling when two consecutive samples indicate that miner exposures are below the proposed action level. MSHA requests comments on this proposal. Please provide supporting information and data.

To illustrate how this contradicts the purpose of the standard, let's consider a scenario where an ISO 23875 compliant cab is delivered to a mining site. If sampling is conducted on the operator of this ISO 23875 compliant machine and the results fall below the permissible exposure limit (PEL) on two consecutive occasions, no further sampling would be required. Consequently, the cab would no longer be obligated to comply with ISO 23875 and, if poorly maintained, could expose the operator to excessive levels of dust regularly. ISO 23875 Annex B makes

affirmative recommendations specific to the maintenance regime and audit processes which ensure consistent air quality performance. Comprehensive use of the ISO 23875 consensus standard, as the path to compliance with the proposed PEL and action level, should be part of the MSHA proposal. Standardization of the process allows for uniform compliance and enforcement with the resulting reduction in operator exposures.

Without the requirement for ongoing sampling, the site would lack the necessary means to enforce strict adherence to maintenance and operational protocols for the machine. There would be no compliance incentives for machine operators and administrative personnel to maintain the initial compliance achieved through the certification process. Discontinuing sampling after two consecutive passing samples assumes behaviors that favor operator protection at both the individual and corporate level.

ISO 23875 is a life cycle standard that is designed to be integrated into the site Occupational Health and Safety Management System (OHSMS). It simplifies and standardizes the approach taken to document and audit all aspects of the machine's maintenance and ongoing operator enclosure air quality performance.

Question 26

MSHA is proposing that mine operators conduct semi-annual evaluations to evaluate whether any changes in production, processes, engineering controls, personnel, administrative controls, or other factors may reasonably be expected to result in new or increased respirable crystalline silica exposures. Please provide comments on this proposal, as well as alternative approaches that would be appropriate for evaluating any potential new or increased respirable crystalline silica exposures. Please provide supporting information and data.

Whenever changes are implemented in any of these areas, it is essential to conduct a risk assessment promptly to evaluate whether the change might lead to increased exposure risks. This assessment should be carried out at the time of the change, without any delay. Relying solely on semi-annual assessments for evaluating these changes is insufficient and exposes miners to unnecessary risks. Conducting timely risk assessments is a standard practice in the mining industry. By conducting these assessments promptly, the need for semi-annual meetings to review these issues is avoided.

Questions 41

Training Requirements

41. MSHA requests the views and recommendations of stakeholders regarding whether training requirements for miners should be included in proposed part 60. Please provide supporting information and data.

ISEEE recommends that education on ISO 23875 be part of MSHA's compliance training. This aligns MSHA with a comprehensive industry standard covering engineering controls, testing, maintenance, and operational integration for mine site safety. No other approach meets the proposed 25 µg/m^3 air quality level. Miners will inquire about operator enclosure air quality compliance, and ISO 23875 w/Amendment 1 is the answer. Education on this standard is crucial for successful adoption of the new silica threshold in mining.

Question 43

MSHA is not proposing to adopt a similar approach as the OSHA Table 1 for the construction industry, where MSHA would prescribe specific exposure control methods for task-based work practices when working with materials containing respirable crystalline silica. See 29 CFR 1926.1153(c)(1). MSHA requests comments on specific tasks and exposure control methods appropriate for a Table 1-approach for the mining industry that also

would adequately protect miners from risk of exposure to respirable crystalline silica. Please provide specific rationale and supporting information, including data on how such an approach would be implemented.

The proposed rule aims to reduce the exposure of mine workers to silica and other respirable particulates. In recognition of the need for a standardized approach to minimize the exposure of mining equipment operators to respirable crystalline silica (RCS), ISO TC-82 - Mining established a working group to develop standards pertaining to operator enclosures. The mining machine manufacturing industry has struggled to develop operator enclosures that effectively protect against respirable dust. Existing SAE and ISO standards did not provide sufficient guidance on designing operator enclosures for hazardous environments, and regional/national standards and regulations varied, resulting in different acceptable exposure levels for RCS (e.g., 100 µg/m3, 50 µg/m3, and 25 µg/m3).

Before February 22, 2021, the common practice was to build a base machine and rely on local machine dealers and aftermarket retrofitters to apply locally determined engineering controls. However, this approach has proven ineffective as a means to exposure reduction. Without clear engineering control requirements and means to assess their effectiveness, not just initially but continuously over the machine's lifespan, operator enclosure air quality designs consistently fell short of expectations.

To address this global mining issue comprehensively, TC-82 Mining assigned WG9 to develop a standard that covers all aspects of the operator enclosure air quality system throughout the cab's lifecycle. Importantly, subject matter expert stakeholders were included in the standard writing process to ensure the inclusion of critical perspectives. Unlike previous committees focused on HVAC and ventilation performance, *WG9 addressed operator air quality*. The working group comprised representatives from ten mining countries, including engineering experts in HVAC and operator cabs, industrial hygienists from major mining companies, and specialists in operator enclosure air quality testing.

The results of the committee's work were published by ISO on February 22, 2021, with an amendment released in June 2022. The standard, ISO 23875:2021 Mining - Air quality control systems for operator enclosures - Performance requirements and test methods. ISO 23875 is technologically achievable, economically feasible, and has gained recognition as the standardized approach for engineering, performance testing, and maintenance of operator enclosures. It offers flexibility and innovation while emphasizing performance throughout the machine's lifespan.

The proposed silica threshold aligns perfectly with ISO 23875, and the standard's minimum performance test results cover key aspects related to dust performance. ISO 23875 ensures that dust concentrations, including RCS, are maintained below the proposed action level of 25 µg/m^3. The industry has embraced the standard, with mining companies like Rio Tinto adopting it as their global machine specification and others retrofitting machines for compliance. Pilot programs and successful implementations have taken place, demonstrating industry recognition of the need for a standardized approach to mitigate RCS overexposure.

The implementation process involves raising awareness of the standard throughout the mining industry, making it available through ANSI, and providing education and training for implementation. Mining machine manufacturers, retrofit companies, and component suppliers have already invested in compliance programs and are preparing to meet the demand generated by an MSHA regulation.

Conclusion

ISEEE strongly recommends including ISO 23875 w/Amendment 1, by reference, in the final MSHA rule. Additionally, ISEEE recommends incorporating education about ISO 23875 into MSHA's compliance training. Aligning with this standard equips MSHA with a comprehensive industry guideline covering controls, testing, maintenance, and site integration for mine safety. The widespread acceptance of ISO 23875 w/Amendment 1 in the industry demonstrates its effectiveness in meeting the proposed 25 $\mu g/m^3$ silica threshold. OSHA's attempt to regulate enclosure air quality via Table 1 of their silica rule was unsuccessful due to the lack of validation from a consensus standard. The health of the nation's miners depends on realistic and unbiased sampling. Sampling should be done by disinterested third parties and not by the MSHA regulated mining company. ISEEE recommends using a single respirable dust sample for the metal/nonmetal industry to establish a standard for both nuisance dust and respirable crystalline silica, similar to the coal industry's approach.

If you have any questions about ISEEE's feedback on this proposed rule or other matters, you can contact me at jeff.moredock@ise3.com or (407) 247-7287. We're grateful for the chance to contribute to this important regulation.

Sincerely,

Jeffrey Moredock

Jeffrey Moredock
President ISEEE

The mission of ISEEE is to protect the lung health of equipment operators through research, education, and consultation in the field of environmental enclosure air quality engineering.

We are committed to developing best practices and educational materials that promote the design, performance, and certification of environmental enclosures that meet the highest standards of safety and health.

By working with professionals and standards organizations in the field, we strive to advance the science and standardization of environmental enclosure engineering and make a positive impact on the lives of equipment operators around the world.

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