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

AIHA'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:

AIHA, the association for scientists and professionals committed to preserving and ensuring occupational and environmental health and safety (OEHS), appreciates the opportunity to provide feedback on the Mine Safety and Health Administration's (MSHA) proposed rule on miner exposure respirable crystalline silica. We hope you find our feedback useful and are happy to answer any questions you may have.

Summary

Crystalline silica is a common mineral found in the earth's crust. Crystalline silica is found in sandstone, sedimentary and igneous rocks commonly found at metal and non-metal mines. Materials like sand, rocks, coal, granite, and gravel contain crystalline silica. Therefore, exposures to silica during mining is widespread and common.

AIHA concurs that under the agency's existing dust standards, miners at metal and nonmetal mines and coal mines face a risk of material impairment of health or functional capacity from exposure to respirable crystalline silica. A revision to the crystalline silica occupational exposure limit for the mining industry is long overdue. AIHA concurs with MSHA on the need for a proposed new respirable crystalline silica standard with improved protection for all miners.

AIHA agrees with the proposal to replace the existing requirements for respiratory protection and incorporate by reference ASTM F3387-19 *Standard Practice for Respiratory Protection*. However, AIHA recommends that MSHA note in the final rule that ASTM3387 refer to the most "recent" edition, since the 2019 edition may become outdated in the future. AIHA also encourages MSHA to provide additional clarity and transparency regarding

changes to referenced standards that are proposed and to clearly communicate these changes during implementation of the final rule.

It should be noted that AIHA does not believe respirators are a solution for possible silica dust inhalation control.

AIHA believes the proposed 50 micrograms of respirable crystalline silica per cubic meter of air PEL is not protective from adverse health effects and recommends a permissible exposure limit (PEL) of 25 micrograms of respirable crystalline silica per cubic meter of air. AIHA also does not believe respirators are an adequate alternative to engineering solutions from crystalline silica exposures in mine work environments.

Health Effects

The International Agency for Research on Cancer (IARC) silica monogram has well documented research describing the health risks from inhalation of respirable crystalline silica.[1] Specific concerns are cancers of the lung, cancers of the stomach, cancer of the esophagus, and cancer of the kidney. NIOSH also has documented the hazard of silicosis.[2]

Preliminary Risk Analysis

Considering the severity of the toxic endpoints from respirable crystalline silica inhalation from many different epidemiological studies, AIHA believes that the MSHA PEL should be lowered to 0.025 milligrams silica respirable fraction per cubic meter of air (i.e., 25 micrograms crystalline silica per cubic meter of air) for a full shift exposure, calculated as an 8-hour time-weighted average, and corrected for shifts longer than 8 hours for all miners to protect against lung fibrosis (silicosis) and lung cancer, the level recognized in the American Conference of Governmental Industrial Hygienists (ACGIH) respirable silica dust Threshold Limit Values (TLV®) documentation.

AIHA does not believe the work of Steenland and Sanderson should be discounted. The Miller and MacCalman study "reports on analyses of cause-specific mortality in a cohort of almost 18,000 men from 10 British collieries."[3] This study showed "evidence of an association between increased risks of lung cancer and increased quartz exposure, particularly at a lag of 15 years. Risks of mortality from non-malignant respiratory disease showed increases with increased exposure to respirable dust." This study did not report on occupational exposure monitoring concentrations. Steenland and Sanderson (2001), however showed "a significant increase in mortality risk from lung cancer at average exposure levels greater than 0.065 mg/m^3 of respirable silica, indicating that 0.05 mg/m^3 would probably not be protective of workers' health." (ACGIH TLV documentation for silica).

[1] https://monographs.iarc.who.int/wp-content/uploads/2018/06/mono100C-14.pdf
[2] https://www.cdc.gov/niosh/topics/silica/risks.html
[3] https://pubmed.ncbi.nlm.nih.gov/19819863/

The Steenland and Sanderson study "examined lung cancer mortality among 4,626 industrial sand workers, estimating exposure via a job-exposure matrix based on 4,269 industrial hygiene samples collected in 1974--1995."[4] ACGIH further states that "there is epidemiological evidence levels of silica exposure 0.025 mg/m^3 respirable particulate matter to protect against the development of silicosis will protect against silica associated lung cancer."[5]

Steenland has published several studies of silica cited in the IARC monograph. For example:

> "Evidence in recent years indicates that silica causes lung cancer, and probably renal disease, in addition to its well-known relationship to silicosis. There is also suggestive evidence that silica can cause arthritis and other auto-immune diseases. Silica has, therefore, joined a handful of other toxic exposures such as tobacco smoke, dioxin, and asbestos which cause multiple serious diseases." (Steenland research (2005): "One agent, many diseases: exposure-response data and comparative risks of different outcomes following silica exposure."[6]

Technological Feasibility of the Proposed Rule

AIHA agrees that technologically feasible air sampling and analysis exist to achieve the proposed PEL using commercially available samplers. AIHA concurs that these technologically feasible samplers are widely available, and a number of commercial laboratories provide the service of analyzing dust containing respirable crystalline silica. AIHA agrees that technologically feasible engineering controls are available, can control crystalline silica-containing dust particles at the source, provide reliable and consistent protection to all miners who would otherwise be exposed to respirable dust.

AIHA also agrees with MSHA that administrative controls, used to supplement engineering controls, can further reduce and maintain exposures at or below the proposed PEL. AIHA concurs that the proposed respiratory protection practices for respirator use are technologically feasible for mine operators to implement. In addition, all uses of respirators must be covered under a written site-specific respirator program which includes prescribed fit test method and respirator selection, and procedures for selecting, maintaining, storing and cleaning respirators. AIHA agrees that the proposed medical surveillance requirements for metal and nonmetal mines (MNM) are technologically feasible.

Preliminary Regulatory Impact Analysis and Regulatory Alternatives

AIHA supports a modified Regulatory Alternative #2, Changes in Sampling and Evaluation Requirements and the Proposed PEL. Under this regulatory alternative, the proposed PEL

[4] https://pubmed.ncbi.nlm.nih.gov/11282798/
[5] https://www.acgih.org/silica-crystalline-a-quartz-and-cristobalite/
[6] Available at https://pubmed.ncbi.nlm.nih.gov/15940719/

would be set at 25 µg/m^3, mine operators would install controls and administrative measures necessary to meet this PEL, and no action level would be proposed, but calculation of upper and lower 95% confidence limits from the exposure monitoring results.

However, AIHA recommends that mine operators: (1) be required to conduct baseline sampling and periodic sampling; (2) conduct semi-annual or more frequent evaluations of changing conditions; and (3) sample as frequently as necessary to determine the adequacy of controls. Mine operators would be required to perform post evaluation sampling when the operators determine from the semi-annual evaluation that miners are exposed at the 95% confidence level to respirable crystalline silica above the proposed PEL of 25 µg/m3.[7]

Scope and Effective Date

AIHA does not believe separate standards should be developed for the MNM mining industry and the coal mining industry. Respirators should only be used as a control method when data from baseline and periodic breathing zone air samples show that the coal mining or MNM operator cannot keep exposures below 25 ug/m3 using feasible engineering or administrative controls.

AIHA concurs that final rule should be effective at least 120 days after its publication.

Definitions

AIHA believes a 25 ug/m3 PEL may preclude the need for an action level. However, the statistics of sampling and sample analysis should be considered to identify upper and lower confidence limits.

AIHA does not believe objective data can replace initial workplace monitoring by a competent industrial hygienist.

Proposed Permissible Exposure Limit

The risk from silica is from the respirable fraction of airborne crystalline silica dust particles. Standard industrial hygiene NIOSH or OSHA analytical methods should be used for PEL determinations.[8] Provisions to the PEL should be made for shifts greater than 8-hours or 40 hour work week, for example as found in the OSHA lead standard.

OSHA has identified requirements for potential exposures above the action level. MSHA can use these requirements as a template for their mine operator requirements.

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[7] For additional information, see NIOSH. Leidel, Bush and Lynch, Occupational Sampling Strategy Manual. https://www.cdc.gov/niosh/docs/77-173/pdfs/77-173.pdf

[8] Please see OSHA exposure evaluation, sampling and analytical methods at https://www.osha.gov/silica-crystalline/sampling-analysis

Methods of Compliance

Although job rotation is an administrative control, other labor issues may be involved which preclude certain rotation of miners from job to job or from one work location to another.

AIHA concurs that feasible engineering and administrative controls be used to keep miners' exposures to respirable crystalline silica below the proposed PEL.

Proposed Exposure Monitoring

Without an action level, statistical analysis of sample exposures is desirable so that 95% confidence levels can be determined by the competent industrial hygienist.

AIHA recommends amending the proposed rule to require mine operators to collect a respirable crystalline silica sample that is taken at random and with enough data to ensure statistical validity. It may not be practical to identify all possible scenarios in a regulated standard and MSHA should consider operator flexibility for compliance. Wind speed, wind direction, precipitation, and temperature all appear to influence measures RCS concentrations for outdoor workers.[9] A competent industrial hygienist should consider these factors when conducting sampling.

Identifying mines which may operate intermittently, or will not be operating sometime in the future, or operating under a reduced schedule is not possible. Therefore, no reduction in PEL or frequency of monitoring are recommended for facilities where miners may not work at year-round or reduced operations.

AIHA recommends all baseline sampling for respirable crystalline silica be collected and that the sampling be completed by a trained and experienced industrial hygienist and samples analyzed by a laboratory accredited under a third party recognized laboratory accreditation body such as the AIHA laboratory accreditation program[10] or equivalent.

AIHA recommends all baseline sampling for respirable crystalline silica be collected over a period long enough to identify potential seasonal variability. The timing for evaluating any changes in production, processes, engineering controls, personnel, administrative controls, or other factors, is workplace specific and requiring evaluations after specific time periods is unnecessary and counterproductive. Furthermore, if changes in production, processes, engineering controls, personnel, administrative controls, or other factors occur, we recommend requiring an evaluation be conducted by an industrial hygienist.

Miners could possibly be exposed at unsafe levels of respirable crystalline silica levels above the PEL due to the gap between the effective date and the proposed compliance date, but

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[9] See https://digitalcommons.unl.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1280&context=publichealthresources and https://academic.oup.com/annweh/article-abstract/67/Supplement_1/i73/7159580

[10] https://www.aihaaccreditedlabs.org/

miners have been potentially exposed to harmful levels of respirable crystalline silica over the past many years.

The assumption that most miners are exposed to at least some level of respirable crystalline silica is probably true, but the proposed requirement that these miners are subject to baseline and periodic sampling will alleviate this assumption.

AIHA recommends resetting the baseline if anything within the process changes which could cause changes in possible airborne respirable crystalline silica concentrations.

AIHA recommends to MSHA that mine operators conduct periodic sampling within three months where the most recent sampling indicates miner exposures are at or above the proposed PEL at the 95% confidence level and continue to sample within three months of the previous sampling until two consecutive samplings indicate that measured miner exposures are below the 95% lower confidence level compared to the PEL. Periodic sampling may depend on several factors related to work activities and baseline sampling results. Depending on workplace circumstances consecutive samples do not necessarily need to be at least seven days apart.

AIHA does not believe two samples can provide confidence that the task is safe from harmful exposures. The need for periodic sampling depends on the professional judgement of a qualified industrial hygienist and the baseline sampling results with consideration of upper and lower confidence levels.

AIHA recommends that miners' exposures are measured using only personal breathing-zone air samples for MNM operations collected in accordance with §§ 70.201(c), 71.201(b), or 90.201(b) for coal operations while using a third-party accredited laboratory for sample analyses.

As an industry practice and in accordance with AIHA Exposure Assessment Strategies Committee the management of exposure control strategies when a SEG exposure category measured, as an upper tail statistical decision, i.e., 90th, 95th or 99th percentile, is 50-100% of an OEL actions are triggered.[11]

AIHA recommends that similar exposure groups be identified while using representative sampling. AIHA concurs that where several miners in similar exposure groups perform the same task on the same shift and in the same work area, the mine operator may sample a representative random sample of miners to meet the proposed exposure monitoring requirements.

AIHA agrees that MSHA should require mine operators to use laboratories accredited to ISO/IEC 17025 "General requirements for the competence of testing and calibration laboratories," where the accreditation has been issued by a body that is compliant with ISO/IEC 17011 "Conformity assessment—requirements for accreditation bodies accrediting

[11] "A Strategy for Assessing and Managing Occupational Exposures, 4th edition". https://www.aiha.org/education/marketplace/strategy-book-4th-edition

conformity assessment bodies." Laboratories should participate in AIHA Proficiency Analytical Testing Program for crystalline silica (IHPAT silica) or equivalent accreditation body.

As technology evolves, new methods may become available for measuring airborne concentrations of respirable silica dust. The proposed regulations must be flexible to recognize new emerging technologies. For example, NIOSH has done research in this area for many years. NIOSH has developed a field-based, "rapid quartz monitor" (RQM). The RQM prototype is "based on three components: (1) a sampler, which is composed of a pump, cyclone and sampling cassette; (2) a Fourier Transform Infrared (FTIR) analyzer; and (3) a software-based quartz concentration calculator." NIOSH showed mines were able to use the field-based prototype RQM to assess the efficacy of control technology and to identify occupations and tasks characterized by high concentrations of respirable silica dust.[12]

Proposed Medical Surveillance for Metal and Nonmetal Miners

The need for medical surveillance depends on the extent of workplace silica exposures. Medical surveillance cannot work in a vacuum and must be coordinated with industrial hygiene exposure monitoring results. Medical surveillance would be most beneficial for work areas and workers who exceed the PEL. The medical surveillance component should include a shared industrial hygiene component.

AIHA concurs that MNM and coal mine operators use NIOSH-approved facilities for medical examinations and to submit for approval to NIOSH a plan for providing miners with the examinations specified. NIOSH standards (42 CFR part 37) should be extended to MNM operators where required. AIHA agrees that the proposed provisions require operators of MNM mines to provide MNM miners with periodic medical examinations performed by physicians or other licensed health care professionals (PLHCP) or specialists including a history and physical examination focused on the respiratory system, a chest X-ray, and a spirometry test. The proposed rule also requires a written medical opinion be provided by the PLHCP or specialist to the mine operator regarding the miner's ability to wear a respirator. Health surveillance data should be matched with exposure monitoring data in coordination with PLHCPs and specialists to track MNM miners' health. AIHA suggests MSHA require operators to keep medical surveillance information for the duration of a miner's employment plus several years depending on the PLHCP recommendation.

As new proven effective and safe technology becomes available, these new technologies should be included in a medical surveillance program.

AIHA believes that industrial hygiene sampling results should be included as part of any medical surveillance program.

[12] https://edworkforce.house.gov/uploadedfiles/john_howard_-_testimony.pdf

AIHA also recommends that the provisions of 30 CFR part 90 with medical removal provisions and protections apply for a medically confirmed diagnosis of silicosis for any mine employee.

Proposed Respiratory Protection Standard

The required use of respirators is the last line of defense against workplace respirable crystalline silica exposures. Respirators can only be used under a comprehensive respiratory protection program and under the supervision of an industrial hygienist. The development and continued maintenance of a respirator program is not inexpensive and may outweigh the cost of effective engineering controls.

AIHA believes that MSHA should refer to the most recent edition of ASTM F3378 and not the 2019 edition which may become obsolete by the time a MSHA silica standard is adopted. AIHA agrees that the standard should provide operators the flexibility to select the elements in the most recent edition of ASTM F3387 that are applicable to their practices of respirator use under the site-specific respirator program at their mines. Mine operators should have the flexibility to choose the ASTM F3387–19 elements that are appropriate for their mine-specific hazards because the need for different types of respirators (e.g., half face versus full face respirators) may vary due to the variability of mining processes, work activities, airborne silica hazards, and commodities mined.

A respirator program requires certain minimally acceptable program elements including program administration; standard operating procedures; medical evaluations; respirator selection; training; fit testing; and maintenance, inspection, and storage. AIHA concurs with the proposal replacing existing requirements for respiratory protection and incorporate by reference ASTM F3387-19 *Standard Practice for Respiratory Protection*. AIHA believes that the MSHA silica standard should include a summary of respirator program components where NIOSH approved respirators are selected, fitted, used, cleaned, and maintained so that the life and health of miners are safeguarded.

Recordkeeping Requirements

AIHA agrees with MSHA proposed requirements as discussed in the Preamble for recordkeeping of industrial hygiene evaluations, records of sampling results, records of corrective actions, and written determination records received from a PLHCP. AIHA recommends an addition for records of an exposure control plan be developed and maintained which identifies tasks that involve exposures above the PEL and methods used to protect workers, including procedures to restrict access to work areas where high exposures may occur.

Training Requirements

AIHA recommends the inclusion of training requirements educating miners that is specific to silica health hazards and silica exposure risks, requirements for respirators with their proper use and administrative controls where necessary relative to worker respirable silica exposures. These requirements should be included in new part 60, Respirable Crystalline Silica, to title 30 CFR, chapter I, subchapter M – Uniform Mine Health Regulations. Proposed part 60, which should apply to all MNM and coal mines and include training requirements to protect and educate all miners from the adverse health risks caused by occupational exposures to respirable crystalline silica, and hazards with possible silica exposures from taking contaminated clothing home and laundering contaminated clothing.

Conforming Changes

Under current MSHA § 70.100 respirable dust standard**s,** each operator shall continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift to which each miner in the active workings of each mine measured with an approved sampling device. AIHA recommends no changes to remove the current applicable coal dust standard from 30 CFR. Silica air sampling should be done in conjunction with respirable dust where the silica fraction of the respirable dust sample is identified. Also, according to MSHA rules, under Part 90, "coal miners who have already developed a pneumoconiosis (or silicosis) can exercise rights that allow them to continue working in healthier parts of the mine."[13]

AIHA recommends that a silicosis diagnosis by a medical provider be included in Part 90 so that miners, either MNM or coal, be allowed to work in "healthier parts of the mine" which do not have potential exposures above the PEL.

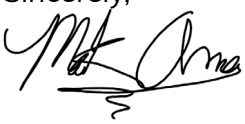
AIHA agrees with MSHA's decision not to include a table of controls that mine operators can put in place in lieu of mandated exposure assessment. There are data that indicates worker exposures in the construction industry can exceed the OSHA PEL of 50 ug/m3 even when the Table 1 controls are in place.[14] That said, AIHA is supportive of MSHA incorporating or recommending relevant control standards designed to protect workers performing certain tasks from respirable dust and RCS, such as the latest version of *ISO 23875:2021 Mining: Air quality control systems for operator enclosures - Performance requirements and test methods* with amendment. Giving mine operators these standard tools will protect workers, and continuing to require normally mandated exposure monitoring will allow mine operators to verify their efficacy.

[13] https://www.msha.gov/part-90-coal-miners
[14] See https://academic.oup.com/annweh/article/67/5/572/7071497 and https://open.library.ubc.ca/media/stream/pdf/24/1.0392974/3

Conclusion

If you have any questions about AIHA's comments on this proposed rulemaking or other matters, please contact me at mames@aiha.org or (703) 846-0730. Thank you for your time and consideration.

Sincerely,



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About AIHA

AIHA is the association for scientists and professionals committed to preserving and ensuring occupational and environmental health and safety in the workplace and community. Founded in 1939, we support our members with our expertise, networks, comprehensive education programs, and other products and services that help them maintain the highest professional and competency standards. More than half of AIHA's nearly 8,500 members are Certified Industrial Hygienists, and many hold other professional designations. AIHA serves as a resource for those employed across the public and private sectors as well as to the communities in which they work. For more information, please visit www.aiha.org.