

**MSHA FINAL RULE:
RESPIRABLE
CRYSTALLINE
SILICA
(30 CFR PART 60)**

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This publication provides practical workplace safety and health information to assist you in making your place of work safer. It is not legal advice. SAIF has made every effort to bring significant Oregon Occupational Safety and Health Administration (Oregon OSHA) regulations to your attention. Nonetheless, compliance with Oregon OSHA remains your responsibility. You should read and understand all relevant Oregon OSHA regulations that apply to your job site(s). You may want to consult with your own attorney regarding aspects of Oregon OSHA that may affect you.

Note: The information in this publication is time sensitive. Do not rely upon this document if its publication date is more than three years old. Please check the "Safety and health" section of our web site at saif.com/safetyandhealth for a more recent, printable copy. You'll also find a variety of other valuable safety information designed to help your business prevent injuries and control costs.

WHAT IS THE PURPOSE OF THE NEW RULE?

The Mine Safety and Health Administration (MSHA) is amending its existing standards to better protect coal and metal/nonmetal (MNM) miners against occupational exposure to respirable crystalline silica, also known as silica dust or quartz dust. In summary, the final rule establishes a uniform permissible exposure limit (PEL), establishes an action level (AL), requires all MNM mine operators to provide medical surveillance in the form of a medical examination regime like the one that already covers coal miners, and updates the existing respiratory protection standard. This document will address the final rule for MNM mines. For more information on coal mines, refer to the final ruling in the Federal Register.

WHAT IS RESPIRABLE CRYSTALLINE SILICA?

Silica is a common component of rock composed of silicon and oxygen (chemical formula SiO₂). It exists in amorphous and crystalline states. The rulemaking focuses on silica in the crystalline state. The most common form of crystalline silica found in nature is quartz, but cristobalite and tridymite also occur in limited circumstances. Respirable crystalline silica consists of small particles of crystalline silica that can be inhaled and reach the alveolar region of the lungs where they can accumulate and cause disease. The respirable crystalline silica particles that are cleared from the lungs by the lymphatic system are distributed to the lymph nodes, blood, liver, spleen, and kidneys, potentially accumulating in those other organ systems and causing renal diseases and other adverse health effects.

WHAT ARE THE HEALTH EFFECTS ASSOCIATED WITH RESPIRABLE CRYSTALLINE SILICA EXPOSURE?

Some of the health effects associated with occupational exposure to respirable crystalline silica are:

- Silicosis (acute silicosis, accelerated silicosis, chronic silicosis, and progressive massive fibrosis)
- Non-malignant respiratory diseases (emphysema, chronic bronchitis)
- Lung cancer
- Kidney disease
- Coal workers' pneumoconiosis (black lung disease)

Each of these are exposure-dependent, potentially chronic, irreversible, potentially disabling, and can be fatal. Silica is classified as a Group 1 human carcinogen by the International Agency for Research on Cancer (IARC).

WHAT ACTIVITIES CAN CAUSE EXPOSURES?

Occupational exposure to respirable crystalline silica occurs during mining activities that can generate silica dust. Such activities include, but are not limited to cutting, sanding, drilling, crushing, grinding, sawing, scraping, jackhammering, excavating, and hauling silica-containing materials.

WHAT IS THE FINAL RULE?

Part 60 of the final rule establishes uniform mandatory health standards for exposure to respirable crystalline silica in MNM mines. It includes 10 sections: scope and compliance dates; definitions; PEL; methods of compliance; exposure monitoring; corrective actions; respiratory protection;

medical surveillance for metal and nonmetal mines; recordkeeping requirements; and severability.

WHAT ARE THE COMPLIANCE DATES?

The final rule took effect on June 17, 2024. Compliance with the final rule is required by April 14, 2025, for coal mine operators. Compliance with the final rule is required by April 8, 2026, for MNM mine operators. Operators of new MNM and coal mines that begin operation after this date must begin sampling upon commencing operations.

WHAT IS THE NEW PEL and AL?

calculated as follows, known as the full shift 8-hour TWA:

$$\frac{\text{(Total mass of respirable crystalline silica } (\mu\text{g})\text{ collected over a full shift)}}{\text{(Air flow rate (liters per minute) x 480 min x 0.001 m}^3\text{/L)}}$$

Regardless of a miner's actual working hours (full shift), 480 minutes is used in the denominator. This means that the respirable crystalline silica collected over an extended period (e.g., a 12-hour shift) is calculated as if it were collected over 8 hours (480 minutes).

WHAT DOES EXPOSURE MONITORING ENTAIL? (§ 60.12)

Periodic evaluations

Miner operators are required to conduct qualitative periodic evaluations at least every 6 months to determine whether changes may reasonably be expected to result in new or increased respirable crystalline silica exposures. Mine operators are required to conduct an evaluation whenever there is a change in production, processes, installation and maintenance of engineering controls, installation and maintenance of equipment, administrative controls, or geological conditions. Mine operators are required to make a record of the evaluation, which includes date of evaluation, evaluated change and the impact on respirable crystalline silica exposure. Mine operators are required to post the record on the mine bulletin board and, if applicable, by electronic means, for the next 31 days.

If the mine operator determines, as a result of the periodic evaluation, that miners may be exposed to respirable crystalline silica at or above the AL, the mine operator shall perform sampling for each of those miners who may be exposed at or above the AL to assess the full shift, 8-hour TWA exposure.

Sampling

Mine operators are required to commence sampling by the compliance date to assess the full shift, 8-hour TWA exposure of respirable crystalline silica for each miner who is or may reasonably be expected to be exposed to respirable crystalline silica and measured based on personal breathing-zone (PBZ) air samples. If the sampling is:

- **Below the AL:** Per paragraph 60.12(a)(4), to discontinue sampling, the second sampling must be taken after the operator receives the results of the prior sampling, within three months but no sooner than 7 days after the prior sampling was conducted. Once two consecutive sample analyses show miners' exposures are below the AL, mine operators may

discontinue sampling for miners whose exposures are represented by these samples, until such time that a subsequent MSHA sampling or post-evaluation sampling by the mine operator indicates that miners may be exposed at or above the AL.

- **Above the AL, but below the PEL:** Mine operators are not required to install additional controls, but instead (in accordance with § 60.12(a)(3)) must sample within three months of the most recent sampling and continue to sample within three months of the previous sampling until two consecutive samplings indicate that miner exposures are below the AL. Once two consecutive sample analyses show a miner's exposures are below the AL, mine operators may discontinue sampling the miner, until a subsequent MSHA sampling or post-evaluation sampling by the mine operator indicates that miner may be exposed at or above the AL. Alternatively, after the most recent sample analyses shows exposures above the AL but below the PEL, the mine operator may choose to take actions to further reduce exposures below the AL and, where successful, discontinue sampling (after meeting the sampling requirements under § 60.12(a)(4)).
- **Above the PEL:** The mine operators must take immediate corrective actions and sample until exposures are at or below the PEL (§ 60.13) and make a record of all sampling and corrective actions. Mine operators are required to immediately report all operator samples above the PEL to the MSHA District Manager or to any other MSHA office designated by the District Manager. Once at or below the PEL, mine operators will resume the three-month schedule.

The mine operator is required to create a record for each sample taken that includes the sample date, the occupations sampled, and the concentrations of respirable crystalline silica and respirable dust. As required in § 60.16(b), any sampling record may be requested at any time by, and must promptly be made available to, miners, authorized representatives of miners, or an authorized representative of the Secretary.

WHICH SAMPLING DEVICES CAN BE USED?

MSHA requires mine operators to use respirable-particle-size-selective samplers that conform to the International Organization for Standardization (ISO) 7708:1995: *Air Quality-Particle Size Fraction Definitions for Health-related Sampling* (ISO 7708:1995(E)) standard to determine compliance with the PEL. Any type of sampling device is allowed for respirable crystalline silica sampling, as long as it conforms to the ISO 7708:1995(E) standard and, where appropriate, meets MSHA permissibility requirements.

WHO SHOULD BE SAMPLED?

Where several miners perform the same tasks on the same shift and in the same work area, mine operators may sample a representative fraction (at least two) of these miners. The representative fraction must include the miners expected to have the highest exposure to respirable crystalline silica. Mine operators must assess the typical circumstances of each shift and each miner to identify miners most at risk for overexposure and choose those miners to be "representative" for sampling purposes. Subsequent sampling must meet the same requirements.

WHAT ARE THE REQUIREMENTS FOR ANALYZING SAMPLES?

All mines are required to use laboratories accredited to ISO/IEC 17025 to analyze samples for respirable crystalline silica using one of the analytical methods specified by MSHA, OSHA, or NIOSH. For MNM samples, the methods used for respirable crystalline silica sample analysis using

X-ray diffractions (XRD) include MSHA P-2, NIOSH 7500, and OSHA ID-142. All three methods can distinguish between the three silica polymorphs.

WHAT IF A MINE CLOSES FOR THE SEASON/AN EXTENDED PERIOD?

When mine operators have closed for the season, or for an extended period (more than 3 months), they are not expected to continue sampling every three months. However, when they re-open, if they have not met the requirements for discontinuing sampling, they would need to start sampling immediately and every three months.

WHAT ARE CORRECTIVE ACTIONS (§ 60.13)?

Section 60.13 requires mine operators to take certain actions when any sampling result indicates that a miner's exposure to respirable crystalline silica exceeds the PEL. Corrective actions are those actions that reduce the respirable crystalline silica concentration to at or below the PEL. The mine operator is required to conduct sampling and implement additional or new corrective actions until a subsequent sampling result indicates miner exposures are at or below the PEL once corrective actions have been taken. The mine operator is required to make a record of corrective actions and the dates of those actions.

WHAT ARE THE DIFFERENT TYPES OF CONTROLS (§ 60.11)?

Engineering controls

Engineering controls, which address the generation of dust at its source, minimize respirable crystalline silica exposures of all miners. The mine operator must install, use, and maintain feasible engineering controls to keep each miner's exposure at or below the PEL. When engineering controls are being developed and implemented as a part of corrective actions, mine operators are to continue corrective action sampling.

Engineering controls generally suppress (e.g., using water sprays, wetting agents, foams, water infusion), dilute (e.g., ventilation), divert (e.g., water sprays, passive barriers, ventilation), or capture dust (e.g., dust collectors) to minimize the exposure of miners working in the surrounding areas. The use of automated ore-processing equipment and remote monitoring can also help to reduce or eliminate miners' exposures to respirable crystalline silica. Examples of engineering controls include:

- Ventilation systems
- Dust suppression devices
- Enclosed cabs or control booths with filtered breathing air
- Wetting agents/water sprays
- Changes in materials handling or equipment used.

Administrative controls

Administrative controls establish work practices that reduce the duration, frequency, or intensity of miners' exposures. Engineering controls are the primary means of controlling respirable crystalline silica; administrative controls can only be used, when necessary, as a supplementary control. Note: Rotation of miners--assigning more than one miner to a high-exposure task or location and rotating

them to keep each miner's exposure below the PEL--is prohibited as means of complying with the rule.

Examples of administrative controls include but are not limited to:

- Work process training
- Housekeeping procedures
- Proper work positions of miners
- Cleaning of spills
- Measures to prevent or minimize contamination of clothing to help decrease miners' exposure to respirable crystalline silica

Personal protective equipment (PPE)

Respiratory protection-§ 60.14:

Respiratory protection will not be allowed for compliance, however, when MNM miners must work in concentrations of respirable crystalline silica above the PEL while engineering controls are being developed and implemented or it is necessary by nature of the work involved, the mine operator shall use respiratory protection as a temporary measure. When exposures are above the PEL, mine operators must take immediate corrective actions, provide miners with respirators, and ensure that they are worn until exposures are below the PEL.

Under the final rule, MSHA requires that the respiratory protection program be in writing and be consistent with the requirements of American Society for Testing and Materials (ASTM) 3387-19, including:

- Program administration
- Standard operating procedures
- Medical evaluation
- Respirator selection
- Training
- Fit testing
- Maintenance, inspection, and storage

DOES THE RULE INCLUDE MEDICAL REMOVAL/TRANSFER?

MSHA does not include a medical removal/transfer option for MNM miners with evidence of silica-related disease in the final rule. MSHA intends to consider this issue in future rulemaking. However, under final §60.14(b), a mine operator must, upon receiving written notification from a physician or other licensed health care professional (PLHCP), facilitate the temporary transfer of an affected miner who cannot wear a respirator to a different area or occupation within the same mine where respiratory protection is not necessary. The final rule requires that transferred miners continue to receive compensation at no less than the regular rate of pay in the occupation that they held immediately prior to the transfer. The affected miner may be transferred back to the miner's initial work area or occupation when temporary use of respirators is no longer required.

WHAT SHOULD BE INCLUDED IN TRAINING?

According to 30 CFR part 46 and 30 CFR part 48 training must include:

- Information in existing training plans about respirable crystalline silica hazards and protections, including:
 - The PEL and AL
 - Sampling requirements
 - Miners who are reasonably expected to be exposed to respirable crystalline silica
 - Engineering and administrative controls used at the mine
 - The importance of maintenance controls
 - Medical surveillance requirements, including the importance of early disease detection.
- Health and safety aspects of the tasks to be assigned, including:
 - The safe work procedures of such tasks
 - The mandatory health and safety standards pertinent to such tasks
 - Information about the physical and health hazards of chemicals in the miner’s work area
 - The protective measures a miner can take against these hazards
 - The contents of the mine’s HazCom program
- Instruction and demonstration on the use, care, and maintenance of self-rescue and respiratory devices, if used at the mine.
- Annual refresher training conducted under part 48.
- Section 46.9 requires records of training and includes specific provisions for the record requirements.

WHAT ARE THE RECORDKEEPING REQUIREMENTS? (Section 60.16)

Medical examinations

Refer to the medical surveillance document ([saif.com/S1279](https://www.saif.com/S1279)) for recordkeeping requirements for written determination records and written medical opinion records.

Periodic evaluation and sampling

Under § 60.12(g), when mine operators sample for respirable crystalline silica, operators must make a record of the sample date, the occupations sampled, and the concentrations of respirable crystalline silica and respirable dust, must obtain the laboratory report, and must make the information available to the miners. The final rule requires mine operators to retain evaluation, sampling, and corrective action records for at least five years.

RESOURCES

Final Rule in Federal Register

Lowering Miners' Exposure to Respirable Crystalline Silica and Improving Respiratory Protection. 30 CFR Parts 56, 57, 60, 70, 71, 72, 75, and 90.

www.govinfo.gov/content/pkg/FR-2024-04-18/pdf/2024-06920.pdf

Mine Safety and Health Administration (MSHA)

www.msha.gov/

NIOSH B-readers in the United States

www.cdc.gov/niosh/chestradiography/php/breader/index.html

NIOSH's Dust Handbook

MSHA supports and encourages the use of NIOSH's Dust Handbook by mine operators to determine feasible and appropriate engineering controls for their mine sites.

www.cdc.gov/niosh/mining/works/coversheet2094.html

ASTM F3387-19 Standard Practice for Respiratory Protection

www.astm.org/f3387-19.html

ISO 7708:1995 - Air Quality - Particle Size Fraction Definitions for Health-Related Sampling

www.iso.org/standard/14534.html

ISO 23875:2021 – Mining – Air Quality Control Systems for Operator Enclosures – Performance Requirements and Test Methods

This ISO standard is a useful tool that promotes feasible dust control equipment manufacture and maintenance practices. Although MSHA has not incorporated it into the final rule, the Agency will keep this standard in mind during future initiatives.

www.iso.org/standard/77249.html