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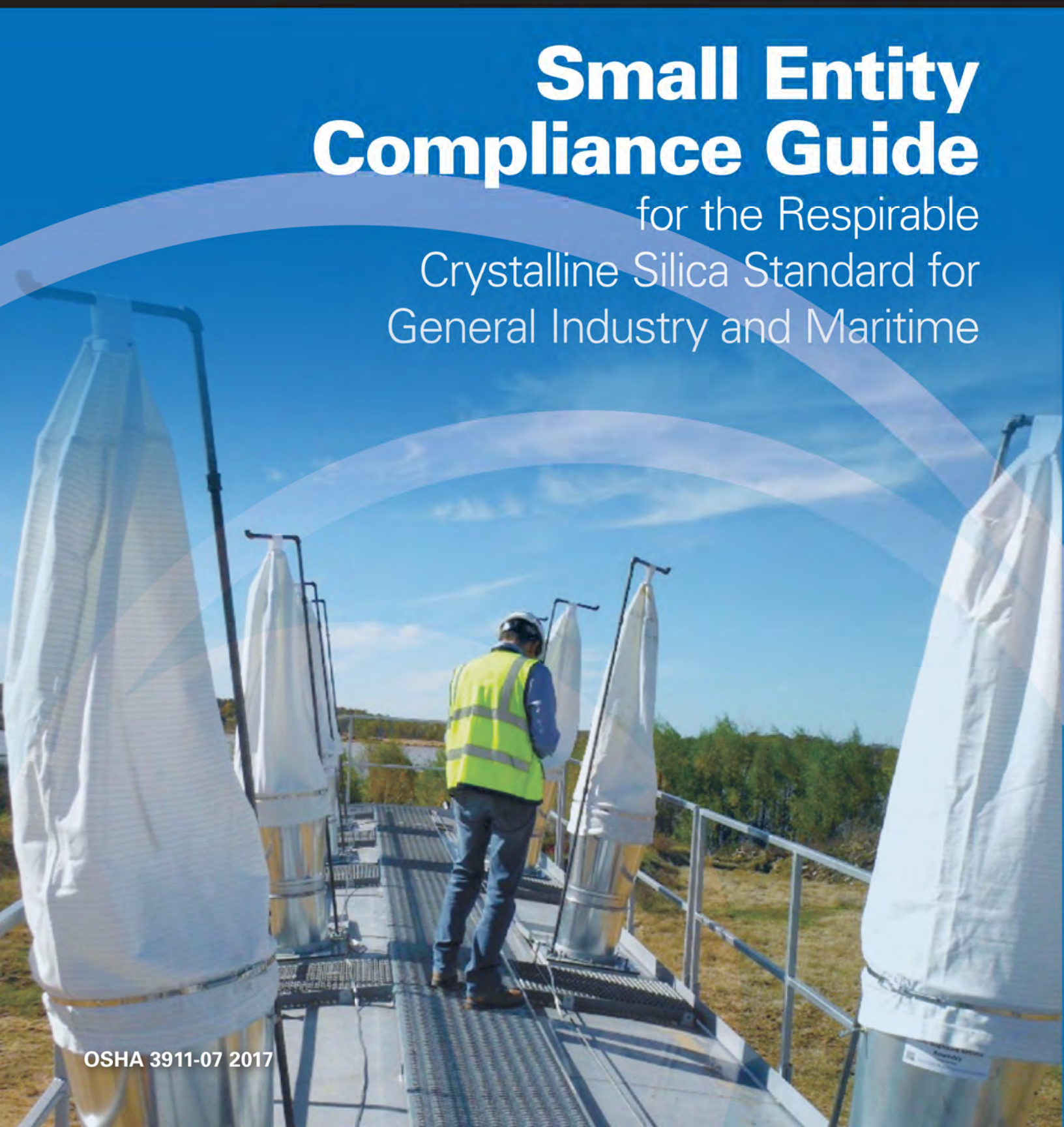
Small Entity Compliance Guide

for the Respirable Crystalline Silica Standard for General Industry and Maritime



OSHA 3911-07 2017

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This publication provides a general overview of a particular standards-related topic. This publication does not alter or determine compliance responsibilities which are set forth in OSHA standards and the *Occupational Safety and Health Act.* Moreover, because interpretations and enforcement policy may change over time, for additional guidance on OSHA compliance requirements the reader should consult current administrative interpretations and decisions by the Occupational Safety and Health Review Commission and the courts.

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Small Entity Compliance Guide

for the Respirable Crystalline Silica Standard
for General Industry and Maritime

Occupational Safety and Health Administration
U.S. Department of Labor

OSHA 3911-07 2017

This guidance document provides an overview of OSHA's Respirable Crystalline Silica Standard for General Industry and Maritime. It is advisory in nature and informational in content. It is not a standard or regulation, and it neither creates new legal obligations nor alters existing obligations created by the Occupational Safety and Health Administration (OSHA) standards or the *Occupational Safety and Health Act of 1970* (OSH Act). Pursuant to the OSH Act, employers must comply with safety and health standards and regulations issued and enforced either by OSHA or by an OSHA-approved state plan. In addition, the Act's General Duty Clause, Section 5(a)(1), requires employers to provide their workers with a workplace free from recognized hazards that are causing or likely to cause death or serious physical harm.

In addition, Section 11(c)(1) of the Act provides that "No person shall discharge or in any manner discriminate against any employee because such employee has filed any complaint or instituted or caused to be instituted any proceeding under or related to this Act or has testified or is about to testify in any such proceeding or because of the exercise by such employee on behalf of himself or others of any right afforded by this Act." Reprisal or discrimination against an employee for reporting an incident, injury, or workplace violation, for participating in medical surveillance, or because of the results of medical surveillance would constitute a violation of Section 11(c) of the OSH Act.

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INTRODUCTION

This guide is intended to help small businesses understand and comply with the Occupational Safety and Health Administration's (OSHA) Respirable Crystalline Silica standard for General Industry and Maritime. Employees exposed to respirable crystalline silica are at increased risk of developing serious adverse health effects including silicosis, lung cancer, chronic obstructive pulmonary disease, and kidney disease. This guide describes the steps that employers are required to take to protect employees in general industry and maritime from the hazards associated with exposure to respirable crystalline silica. Employers in the construction industry should refer to the *Small Entity Compliance Guide for Occupational Exposure to Respirable Crystalline Silica in Construction*.

This document provides guidance only, and does not alter or determine compliance responsibilities, which are laid out in OSHA standards and the *Occupational Safety and Health Act*. This guide does not replace the official Respirable Crystalline Silica standard for general industry and maritime. The employer must refer to the standard to ensure that it is in compliance. Moreover, because interpretations and enforcement policy may change over time, for additional guidance on OSHA compliance requirements the reader should consult current administrative interpretations and decisions by the Occupational Safety and Health Review Commission and the courts.

What is Respirable Crystalline Silica?

Crystalline silica is a common mineral found in naturally occurring and man-made materials like stone or artificial stone countertops and sand. Amorphous silica, such as silica gel, is not crystalline silica.

Employees can be exposed to respirable crystalline silica – very small particles typically at least 100 times smaller than ordinary sand found on beaches or playgrounds – during the manufacturing of products like glass, pottery, ceramics, brick, concrete, and artificial stone. They can also be exposed during abrasive blasting with sand and during the use of industrial sand in operations such as foundry work and hydraulic fracturing.

SCOPE – PARAGRAPH (A) OF THE STANDARD

The standard applies to all occupational exposures to respirable crystalline silica, except for the following:

- Construction work as defined by 29 CFR 1910.12(b), which is covered by the respirable crystalline silica construction standard (29 CFR 1926.1153);
- Agricultural operations, which are covered by OSHA's occupational safety and health standards for agriculture and,
- Exposures that result from the processing of sorptive clays.

The standard also does not apply to the following:

- Where the employer has objective data that employee exposure to respirable crystalline silica will remain below 25 micrograms per cubic meter of air (25 $\mu g/m^3$) as an 8-hour time-weighted average (TWA) under any foreseeable conditions;
- Where the employer chooses to comply with the construction standard (29 CFR 1926.1153) for tasks performed that are indistinguishable from a construction task listed on Table 1 of the construction standard, provided the tasks are not performed regularly in the same environment and conditions.

Exposures from Sorptive Clay Processing

Exposures from the processing of sorptive clays are excluded from this standard. Sorptive clays such as bentonite are specific types of clay found in a few geologic deposits in the country that are used in a range of consumer products and industrial applications, such as pet litter and sealants for landfills. The occluded quartz found in sorptive clays is considerably less toxic than unoccluded quartz, and there is insufficient evidence for its inclusion in the standard. However, the processing of sorptive clays remains subject to the permissible exposure limit (PEL) in 29 CFR 1910.1000 Table Z-3 (i.e., the formula that is approximately equivalent to 100 µg/m³).

Exposures Below 25 µg/m³ Under Any Foreseeable Conditions

Exposures that will not exceed 25 µg/m³ averaged over an 8-hour day under any foreseeable conditions are excluded from the standard. Employers must have objective data demonstrating employee exposure to respirable crystalline silica associated with a particular product or material or a specific process, task, or activity will remain below this level.

When using the phrase "any foreseeable conditions" OSHA is referring to situations that can reasonably be anticipated. OSHA considers failure of engineering controls to be a situation that is reasonably foreseeable. It is foreseeable that controls could breakdown and lead to over exposures. Although engineering controls are usually a reliable means for controlling employee exposures, equipment does occasionally fail. Thus, the standard applies where exposures below 25 µg/m³ as an 8-hour TWA are expected or achieved, but only because engineering controls are being used to limit exposures.

General Industry and Maritime Work Indistinguishable from Table 1 Construction Work

For general industry and maritime work that is indistinguishable from work covered by Table 1 in the construction silica standard, the employer may comply with the construction standard, including the specified exposure control methods in Table 1 for that task. The task must not be performed regularly in the same environment and conditions.

For example, an employee repairing or maintaining existing power delivery lines (considered a general industry task) uses a handheld drill that is the same as that used while installing new power delivery lines (considered a construction task). This maintenance task is the same as the construction task and would occur in a variety of locations. The employer could protect the employee doing the maintenance task by following the entire construction standard, including the Table 1 entry for the specific task.

Conversely, the construction standard could not be used by a general industry and maritime employer for sanding or cutting of concrete blocks in a concrete block manufacturing plant, because that is a task performed regularly in the same environment and conditions. Such an employer would not require the accommodation of Table 1, which is intended in part to address tasks performed in different environments and conditions. Similarly, an employer whose business includes chipping out concrete from inside the drums of ready-mixed concrete trucks using pneumatic chipping tools may not follow the construction standard because that task will be performed regularly and in a relatively stable and predictable environment.

DEFINITIONS – PARAGRAPH (B) OF THE STANDARD

Definitions are included in the standard to describe the meaning of terms used. Some of these terms are further explained as follows:

Action level means an airborne concentration of 25 µg/m^3 calculated as an 8-hour TWA. Exposures at or above the action level trigger requirements for exposure assessment and medical surveillance.

Employee exposure means the exposure to airborne respirable crystalline silica that would occur if the employee were not using a respirator.

High-efficiency particulate air (HEPA) filter means a filter that is at least 99.97 percent efficient in removing mono-dispersed particles of 0.3 micrometers in diameter. HEPA-filtered vacuuming is an example of a housekeeping method that minimizes employee exposure to respirable crystalline silica.

Objective data means information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to respirable crystalline silica associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions closely resembling or with a higher exposure potential than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

Physician or other licensed health care professional [PLHCP] is an individual whose legally permitted scope of practice (*i.e.*, license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the particular health care services required by this standard.

Specialist means an American Board Certified Specialist in Pulmonary Disease or an American Board Certified Specialist in Occupational Medicine.

PERMISSIBLE EXPOSURE LIMIT (PEL) – PARAGRAPH (C) OF THE STANDARD

Employers must ensure that their employees' exposures to respirable crystalline silica do not exceed the PEL, which is 50 µg/m^3 as an 8-hour TWA. This means that over the course of any 8-hour work shift, exposures can fluctuate, but the average exposure to respirable crystalline silica cannot exceed 50 µg/m^3. The PEL applies to the three forms of respirable crystalline silica that are covered by the standard: quartz, cristobalite, and trydimite. Quartz is by far the most common form of crystalline silica found in general industry and maritime workplaces, and in most cases, quartz will be the only form of respirable crystalline silica analyzed in air samples used to measure employee exposures.

Calculation of TWA Exposures

Both the PEL and the action level are expressed as TWA exposures. TWA measurements account for variable exposure levels over the course of a work shift by averaging periods of higher and lower exposures. The TWA exposure for an 8-hour work shift is calculated using a simple formula:

TWA = (Ca Ta + Cb Tb . . . Cn Tn) ÷ 8

Where:

TWA is the time-weighted average exposure for the work shift

C is the concentration during any period of time (T) where the concentration remains constant; and

T is the duration in hours of the exposure at the concentration (C)

For example, assume that an employee is exposed to respirable crystalline silica in an 8-hour workday as follows:

Two hours exposure at 100 µg/m^3

Two hours exposure at 50 µg/m^3

Four hours exposure at 10 µg/m^3

Entering this information in the formula, we get:

(2 x 100 + 2 x 50 + 4 x 10) ÷ 8 = 42.5 µg/m^3

Because 42.5 µg/m^3 is higher than 25 µg/m^3, this employee's TWA exposure would be above the action level, but below the PEL of 50 µg/m^3.

EXPOSURE ASSESSMENT – PARAGRAPH (D) OF THE STANDARD

Employers must assess the 8-hour TWA exposure for each employee who is or may reasonably be expected to be exposed to respirable crystalline silica at or above the action level of 25 µg/m^3 as an 8-hour TWA. The purposes of assessing employee exposures include: identifying where exposures are occurring; helping the employer select control methods and make sure those methods are effective; preventing employees from being exposed above the PEL; providing employees with information about their exposure levels; and allowing the employer to give the PLHCP performing medical examinations information about employee exposures.

Employers can choose between two options for assessing exposures:

- The performance option; or
- The scheduled monitoring option.

Performance Option

The performance option gives employers flexibility to determine the 8-hour TWA exposure for each employee based on any combination of air monitoring data or objective data that can accurately characterize employee exposures to respirable crystalline silica.

Air monitoring data are any results of air monitoring (analyzed according to the procedures and requirements in Appendix A) that the employer has done to meet the requirements of the standard.

Objective data is information that demonstrates employee exposure to respirable crystalline silica associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions that closely resemble or could result in higher exposures than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

Examples of objective data are information such as:

- Air monitoring data from industry-wide surveys;
- Calculations based on the composition of a substance;
- Area sampling results and exposure mapping profile approaches; and
- Historical air monitoring data collected by the employer.

Employers choosing the performance option must:

- Conduct the exposure assessment before work begins;
- Reassess exposures whenever a change in production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or higher exposures at or above the action level, or when the employer has any reason to believe that new or additional exposures at or above the action level have occurred;
- Be able to demonstrate that employee exposures have been accurately characterized; and
- Make sure that the exposure assessment reflects the exposures of employees on each shift, for each job classification, in each work area.

The performance option may be especially useful when measuring employee exposures is challenging, such as when tasks are performed only occasionally.

The performance option gives employers flexibility for characterizing the exposures of all employees. For example, instead of

Examples of Using Objective Data to Conduct Exposure Assessments under the Performance Option

1. Industry-wide surveys of typical tasks or operations, which include well-documented procedures for measuring exposures and methods for controlling dust, could be used by employers to characterize employee exposures where employees perform tasks consistent with those described in the survey.
2. Employers can use direct-reading instruments to measure real-time levels of respirable dust in the air. If the employer has information on the percentage of respirable crystalline silica in that dust (for example, from the analysis of a bulk sample or information from a safety data sheet), he or she can then calculate the level of respirable crystalline silica in air.
3. Historical air monitoring data collected by the employer could be used to assess employee exposures if the employer can show that the data were collected during work operations and conditions that are consistent with the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

conducting air monitoring on two employees who perform the same job on different shifts, the employer could determine that there are no differences in exposure between those two employees, and characterize the exposure of the second employee based on the air monitoring results of the first employee.

Under the performance option, employers can characterize employee exposure within a range to account for exposure variability. Employers can also use that option to show that exposures exceed the PEL by a certain level, such as less than 10 times the PEL, after using all feasible controls. The employer would then know that he or she must provide respiratory protection with an assigned protection factor (APF) of at least 10.

Scheduled Monitoring Option

The scheduled monitoring option lets employers know when and how often they must perform exposure monitoring to measure employee exposures. When following the scheduled monitoring option, employers must make sure that:

- Results represent the employee's TWA exposure to respirable crystalline silica over an eight-hour workday;
- Samples are collected from the employee's breathing zone; and
- Samples are collected outside respirators so that they represent the exposure that would occur without the use of the respirator.

OSHA intends for employers using the scheduled monitoring option to conduct initial monitoring as soon as work begins so that they are aware of exposure levels and where control measures are needed.

Under the scheduled monitoring option, just as under the performance option, employers must correctly characterize each employee's exposure to respirable crystalline silica.

Exposure monitoring must include, at a minimum, one full-shift sample taken for each job function in each job classification, in each work area, and on each shift. Characterizing each employee's exposure may involve monitoring all exposed employees or a smaller number of employees whose exposures can then represent those of other employees.

Representative sampling involves monitoring the employee or employees reasonably expected to have the highest exposure to respirable crystalline silica (for example, the employee closest to an exposure source). This exposure is then assigned to the other employees in the group who perform the same tasks on the same shift and in the same work area.

Representative monitoring is allowed when several employees perform the same job on the same shift and under the same conditions.

How Often Employers Must Monitor under the Scheduled Monitoring Option

Under the scheduled monitoring option, how often monitoring must be done depends on the results of initial monitoring and, thereafter, any required further monitoring, as follows:

- If the initial monitoring indicates that employee exposures are below the action level, no further monitoring is required.
- If the most recent exposure monitoring reveals employee exposures at or above the action level but at or below the PEL, the employer must repeat monitoring within six months of the most recent monitoring.
- If the most recent exposure monitoring reveals employee exposures above the PEL, the employer must repeat monitoring within three months of the most recent monitoring.
- When two non-initial monitoring results taken consecutively, at least 7 days apart but within 6 months of each other, are below the action level, employers

may stop monitoring for employees represented by those results, as long as no changes occur that could reasonably be expected to result in new or additional exposures at or above the action level.

Reassessment of Exposures

The employer must reassess exposures whenever a change in production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures to respirable crystalline silica at or above the action level, or when the employer has any reason to believe that new or additional exposures at or above the action level have occurred. For example, reassessment would be required when a material used in a process is replaced by a material with a higher silica content because the change could reasonably be expected to result in higher exposures to respirable crystalline silica.

Employers do not have to conduct additional monitoring simply because a change has occurred, so long as the change is not reasonably expected to result in new or additional exposures to respirable crystalline silica at or above the action level. For example, reassessment is not required when a task is moved from an enclosed space to a larger location, or when a product is replaced with another product that has lower crystalline silica content in the same process.

Methods of Sample Analysis (Appendix A of the Standard)

Appendix A of the silica standard lists laboratory procedures for measuring respirable crystalline silica in air samples. Employers must make sure that all air samples taken to meet the requirements of the silica standard are analyzed by a laboratory that follows the procedures in Appendix A. If employers hire an outside laboratory to do the analyses for respirable crystalline silica, they can rely on a statement from that laboratory that it follows Appendix A. For example, the laboratory could indicate that it analyzes samples according to Appendix A of the standard in the laboratory report or on its website.

Employee Notification

Employers must notify each affected employee of the results of the exposure assessment within 15 working days of completing it. "Affected" means all employees whose exposures were assessed, including employees whose exposures were represented by other employees' exposure measurements, and those whose exposure assessments were based on objective data. The 15-day period for notification starts when:

- An employer following the performance option finishes the exposure assessment; or
- An employer following the scheduled monitoring approach receives the laboratory results.

Employers must either notify each employee in writing or post the results in a location that all affected employees can access. In cases where an employee might have moved onto another job or jobsite, the assessment results could be included with the employees' final paycheck.

Exposures can be characterized and reported as a range (for example, between the action level and the PEL), but must reflect exposures that would occur if the employee were not using a respirator.

When an exposure assessment reveals exposures above the PEL, the written notification must also describe the corrective action the employer is taking to reduce employee exposures to or below the PEL. Corrective actions include engineering controls. However, if engineering controls are not feasible or the employer needs more than 15 days to identify the right engineering controls, respiratory protection is the corrective action that would be described in the written notification.

Observation of Monitoring

The employer must let affected employees or their designated representatives observe any air monitoring of employee exposure to respirable crystalline silica. When observation of monitoring requires entry into an area where use of protective clothing or equipment, such as a respirator, is required, the employer must provide the observer with that protective clothing or equipment. The employer must provide the protective clothing and equipment at no cost, and make sure that the observer uses such clothing or equipment.

However, if the observer does not need to enter an area requiring the use of protective clothing or equipment in order to effectively observe monitoring (for example, if monitoring can be viewed from outside the hazardous areas), no protective clothing or equipment would be needed.

REGULATED AREAS – PARAGRAPH (E) OF THE STANDARD

Regulated areas are workplace areas where exposures to respirable crystalline silica are, or can reasonably be expected to be, above the PEL. The standard for general industry and maritime requires employers to establish, demarcate, and limit access to regulated areas. The employer must also provide respirators and make sure they are used by those who must enter regulated areas.

The purpose of a regulated area is to:

- Ensure that employees know that silica levels are likely to exceed the PEL within the regulated area;
- Restrict the number of employees who could be exposed above the PEL by requiring the employer to mark areas where exposures are or are likely to be higher than the PEL; and
- Ensure that all who enter are properly protected with an appropriate respirator.

Establishing Regulated Areas

Employers must establish regulated areas where exposures to airborne concentrations of respirable crystalline silica are, or can reasonably be expected to be, greater than the PEL. Information used to measure employees' exposures can be used to determine where regulated areas are required and identify the boundaries of these areas. For example, employers can use any combination of personal samples (air samples collected near the employee's breathing zone), or objective data such as exposure mapping and real-time measurements to establish regulated areas.

Demarcating Regulated Areas

Employers must demarcate (mark off) regulated areas from the rest of the workplace in a manner that decreases the number of employees exposed to respirable crystalline silica within the regulated area. Cones, stanchions, tape, barricades, lines, or textured flooring are some of the ways of marking the boundaries of regulated areas.

Employers must post a sign at each entrance to regulated areas that reads:

DANGER
RESPIRABLE CRYSTALLINE SILICA
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION IN THIS AREA
AUTHORIZED PERSONNEL ONLY

The signs show employees that they are entering a regulated area, and the content of the sign ensures the employee will know the hazards associated with the area, as well as the need for respiratory protection.

Limiting Access to Regulated Areas

Employers must limit access to regulated areas to:

- Persons authorized by the employer and required by work duties to be present in the regulated area. This includes persons whose work is with or near the respirable crystalline silica-producing materials, but may also include maintenance and repair personnel, management, quality control engineers, or other employees if their job duties require them to be in the regulated area;
- Any person entering the area as a designated representative of employees to observe silica exposure monitoring; or
- Any person authorized by the *Occupational Safety and Health Act* or regulations issued under it to be in a regulated area (*e.g.*, OSHA enforcement personnel).

Access restrictions limit the number of persons who may enter into or walk or drive vehicles through areas where exposures exceed the PEL. Therefore, it protects employees who would otherwise be exposed when needlessly spending time in or passing through the regulated area.

Providing Respirators to those Entering Regulated Areas

The employer must:

- Provide each employee and the employee's designated representative entering a regulated area with an appropriate respirator that meets the requirements for respiratory protection under the Respiratory Protection standard; and,
- Require the employee and representative to use the respirator while in the regulated area.

Persons must put on respirators before entering, and take off respirators after exiting the regulated area. The employer must provide and ensure the use of the appropriate respirator to any employees or representatives who enter these areas, regardless of their work activities or the amount of time they spend inside. Requiring all employees and representatives to wear respirators in a regulated area ensures that they are protected.

METHODS OF COMPLIANCE – PARAGRAPH (F) OF THE STANDARD

The methods of compliance section of the standard requires employers to protect employees following the hierarchy of controls, which relies on engineering and work practice controls for reducing exposures and allows for respirator use, in addition to those controls, only when feasible engineering controls cannot reduce exposures to acceptable levels. The methods of compliance section also requires employers to prepare a written exposure control plan, and it cross-references other OSHA standards that apply to abrasive blasting.

Engineering and Work Practice Controls

Employers must use engineering and work practice controls to reduce and keep employee exposure to respirable crystalline silica to or below the PEL of 50 µg/m^3, unless the employer can demonstrate that such controls are not feasible. If feasible engineering and work practice controls are not able to reduce employee exposures to or below the PEL, employers must still use feasible controls to reduce exposures to the lowest possible level and then use respiratory protection along with those controls.

The main types of engineering controls for silica are wet methods and local exhaust ventilation. Wet methods involve applying water or foam at the point of dust generation to keep dust from getting into the air. An example is a grinder that delivers water at the point of contact. Local exhaust ventilation removes dust by capturing it at or near the point where it is created. An example is an exhaust hood that captures dust at the point where it is created.

Another engineering control is isolation. Isolation separates employees from the dust source by containing the dust or isolating employees. An example is a properly ventilated control booth.

Work practice controls involve performing a task in a way that reduces the likelihood or levels of exposure. Work practice controls are often used with engineering controls to protect employees. Employees must know the appropriate work practices for maximizing the effectiveness of controls and minimizing exposures. Examples of work practice controls include:

- Inspecting and maintaining controls to prevent or fix malfunctions that would result in increased exposures;
- Ensuring that tools with wet controls spray water at the point of dust generation;
- Positioning local exhaust hoods directly over the exposure source and not opening windows near the local exhaust source;
- Wetting down silica dust before sweeping it up; and
- Scheduling work so that tasks that involve high exposures are performed when no other employees are in the area.

Reducing exposures through the primary use of engineering and work practice controls is known as the hierarchy of controls, and it is a long-standing OSHA policy. Advantages of engineering controls are that they:

- Control crystalline silica-containing dust particles at the source, thus minimizing exposures to all persons in the surrounding work area;
- Are reliable, predictable, and provide consistent levels of protection to a large number of employees;
- Can be monitored; and
- Are generally less prone to human error than is the use of personal protective equipment.

Under the hierarchy of controls, respirators can be another effective way to protect employees. However, respirators may be less practical or effective than engineering controls for the following reasons:

- They must be selected for each worker, fitted, occasionally refitted, and regularly maintained (including replacing filters and other parts as necessary).
- Employees have to consistently and correctly use properly fitted respirators but may resist wearing them because respirators can be uncomfortable, especially in hot weather.
- Respirators may put a physical strain on employees' bodies, as a result of the respirator's weight and because they increase breathing resistance. Employees with some health conditions cannot wear respirators because the physical strain of wearing the respirator increases their risk of illness, injury, and even death.
- Respirators can create safety concerns because they interfere with workers' ability to hear, see, smell, and communicate.
- Respirators only protect the employees wearing them.

Even when engineering and work practice controls cannot reduce exposure levels to or below the PEL, those controls must be used to reduce exposures as low as possible. This reduction in exposure levels benefits employees by reducing the required protection factor of the respirator, and thus increasing the choices of respirators that can be used. For example, if feasible engineering controls reduce exposures from 50 times to less than 10 times the PEL, employers could provide approved half-mask respirators with an APF of 10 that may be lighter and easier to use compared to full-facepiece respirators.

Written Exposure Control Plan

All employers covered by the standard must develop and implement a written exposure control plan. Written exposure control plans describe workplace exposures and ways to reduce those exposures, such as engineering controls, work practices, and housekeeping methods. The plans improve employee protections by making sure that employers identify all exposures and controls to prevent overexposures. Such plans are also useful for letting employees know what kind of protections they should expect to see on the job.

What Must be Included in a Written Exposure Control Plan

Below is a list of what the employer must include in each section of the written exposure control plan, with general examples of the types of information that could be included and sample entries for tasks conducted at a glass manufacturing plant.

The plan must include a description of workplace tasks involving exposures to respirable crystalline silica. Employers must list all tasks that employees perform that could expose them to respirable crystalline silica dust.

Example:

Raw Material Handling: Sand is delivered from rail cars or trucks to storage silos through enclosed, pneumatic conveyor systems.

Batch Operations: Sand is transferred from storage facilities to weigh stations, mixers and furnaces through enclosed pneumatic conveyor systems.

The plan must include a description of engineering controls, work practices, and respiratory protection used to limit employee exposure to respirable crystalline silica for each task. For each task that employees perform, employers must describe types of controls used, like:

- Enclosures,
- Effective work practices, as in checking the enclosure for leaks, and
- If required, appropriate respiratory protection, like a respirator with an APF of 10.

Employers could also describe signs that controls are not working effectively, such as an increase in visible dust or no water being delivered to the material.

Example:

Controls:

- For raw material handling and batch operating tasks, pneumatic conveyor systems are enclosed and maintained at negative pressure.
- Water is misted onto sand before it is mixed in batch operations.

Work practices:

- Check that connections between rail cars or trucks and storage silos are effectively sealed before transferring sand.
- Apply water mist to sand before batch operations.
- Check to make sure sand is not released from any point of the pneumatic transfer system. If sand is being released, have a supervisor or engineer inspect the system.
- Inspect enclosures and seals on the pneumatic transfer system for damage weekly.
- Measure pressure in the pneumatic system daily.

Respiratory protection:

- No respirators are required during normal operations.
- See respiratory protection program for information on respirator requirements for situations such as spills or maintenance.

The plan must include a description of the housekeeping methods used to limit employee exposure to respirable crystalline silica. While employees are cleaning, dust

can become airborne and expose them to silica. In this part of the written exposure control plan, employers must list acceptable cleaning methods that will be used to prevent employees from being exposed and any protections that are needed if certain cleaning methods have to be used.

The *Housekeeping* section of the standard requires that, when cleaning up dust that can contribute to employee exposures to respirable crystalline silica, employers must:

- Not allow cleaning by dry brushing and sweeping, unless methods such as wet sweeping and HEPA-filtered vacuuming are not feasible;
- Not allow cleaning of surfaces or clothing with compressed air, unless the compressed air is used together with a ventilation system that effectively captures the dust cloud or no other cleaning method is feasible.

This section of the written plan would include cleaning methods that are acceptable (*e.g.*, wet sweeping), cleaning methods that are unacceptable because acceptable cleaning methods are feasible (*e.g.*, dry sweeping), and special instructions (*e.g.*, use local exhaust ventilation if compressed air must be used). Hygiene-related subjects, such as not using compressed air to clean clothing, could also be addressed in this section of the written exposure control plan.

Example:

- Use the central vacuum system for cleaning.
- Use a HEPA-filtered vacuum for cleaning spills.
- Do not dry sweep.

Yearly Review of Written Exposure Control Plans

The Respirable Crystalline Silica standard requires employers to review and evaluate the effectiveness of the written exposure control plan at least once a year and update it as necessary. A yearly review is needed to make sure that all information in the plan is up-to-date. For example, the employer might have bought a new type of equipment or asked employees to conduct a new task involving exposure, and that information needs to be described in the written plan.

Availability of the Written Exposure Control Plan

Employers must allow the written exposure control plan to be viewed or copied by each employee covered by the standard, their designated representative, and representatives from OSHA or NIOSH, upon request. Making the written exposure control plan available to employees and their designated representatives empowers and protects employees by letting them and their representatives know the silica hazards the employer identified and controls for those hazards. This allows employees and representatives to question employers if controls are not fully and properly implemented or maintained. Likewise, making written exposure control plans readily available to OSHA or NIOSH allows them to verify that employee protections are effective. If OSHA inspects a workplace, the OSHA Compliance Safety and Health Officer will ask to see the employer's written exposure control plan.

Sample Written Exposure Control Plans

To help employers develop written exposure control plans, a sample plan is included below. This sample shows an easy-to-use format that can be changed to address the specific tasks performed by each employee. The sample plan meets the requirements of the standard and contains the level of detail that OSHA considers useful for employers in helping them protect their employees. As the sample shows, the plan can contain useful information without being long or complicated.

Unions, trade associations or professional groups may offer sample written exposure control plans or other assistance to employers, which might be helpful, especially if written exposure control plans are tailored to a particular type of work performed. Although such general guidance may be helpful, employers must make sure that any plan they use is tailored to address all the information required by the standard and all tasks, tools, and controls used by the employer.

Some sample plans might call for more information than is required by the silica standard (for example, information about exposure assessments, medical surveillance, and training). Employers can include this information in the plan if it is useful to them, but they are not required to do so under the silica standard.

Written Exposure Control Plan

Company: Countertops, Inc.
Person Completing the Plan, Title: Mary Smith, Owner

Description of Task:
- Stone or engineered stone slabs are cut using a gantry saw.
- Stone or engineered stone slabs are ground using an electric, handheld angle-grinder.
- Stone or engineered stone slabs are polished using a high-speed polisher.

Task/Control Description
- The gantry saw is operated with recirculated water in an enclosed, ventilated booth.
- The handheld grinders and polishers are operated using water, except for specialty cuts that are performed dry, in which case the grinder is equipped with a shroud attached to a HEPA-filtered vacuum.

Work Practices (for tasks described above that use wet method controls):
- Use a hose to wet the slab off before cutting, grinding, or polishing each section.
- Make sure the slab is positioned underneath the local exhaust hood when sawing, and check flow rate of that local exhaust hood daily.
- Make sure that water is continuously delivered to the point of cutting, grinding, or polishing.
- Change recirculated water if silt build-up occurs.
- Check for proper function of controls by making sure water is flowing to the blade.

Work Practices for Dry Grinding and Polishing:
- Check that shroud is intact and properly installed. Keep shroud flush with working surface, whenever possible.
- Check that vacuum hosing is intact and not kinked or bent.
- Clean or change filters as needed to prevent clogging.
- Check for proper function of controls by making sure visible dust does not increase.

Respiratory protection:
- Respirators are not needed if controls are working and proper work practices are being followed.

Housekeeping:

- Hose down floor frequently and at the end of each work shift.
- Clean up wet slurry to prevent it from drying and becoming airborne.

Abrasive Blasting

In addition to complying with requirements to use engineering controls and work practices according to the hierarchy of controls, employers that conduct abrasive blasting operations using crystalline silica-containing blasting agents or conduct abrasive blasting on substrates that contain crystalline silica must also comply with other relevant standards. These standards include the ventilation standard for general industry (29 CFR 1910.94), the mechanical paint removers standard for shipyards (1915.34), and the personal protective equipment standard for shipyards (29 CFR 1915 Subpart I). This is simply a cross-reference to other standards that employers must comply with when conducting abrasive blasting.

RESPIRATORY PROTECTION – PARAGRAPH (G) OF THE STANDARD

Employers must provide employees with appropriate respirators where required by the silica standard. The respirators must comply with requirements of the silica standard and with OSHA's Respiratory Protection standard (29 CFR 1910.134).

Employers must provide respiratory protection:

- Where exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls;
- Where exposures exceed the PEL during tasks, such as some maintenance and repair tasks, for which engineering and work practice controls are not feasible;
- During tasks in which the employer has implemented all feasible engineering and work practice controls but exposures remain above the PEL; and
- While the employee is in a regulated area.

Where respirator use is required, employers must implement a respiratory protection program in accordance with the Respiratory Protection standard. The respiratory protection program ensures that respirators are properly used in the workplace and are effective in protecting employees. *See* the *Small Entity Compliance Guide for the Respiratory Protection Standard* for information on the requirements of that standard.

Voluntary Use of Respirators

Employers may provide respirators at the request of employees or let employees use their own respirators when respirators are not required under the silica standard. *See* the *Small Entity Compliance Guide for the Respiratory Protection Standard* for information about employer responsibilities when employees voluntarily wear respirators.

HOUSEKEEPING – PARAGRAPH (H) OF THE STANDARD

The Respirable Crystalline Silica standard requires all employers covered by the standard to avoid certain housekeeping practices. When cleaning up dust that could contribute to employee exposure to respirable crystalline silica, employers must:

- Not allow dry brushing or dry sweeping, unless methods such as wet sweeping and HEPA-filtered vacuuming are not feasible;
- Not allow cleaning of surfaces or clothing with compressed air, unless the compressed air is used together with a ventilation system that effectively captures the dust cloud or no other cleaning method is feasible.

Cleaning methods such as dry sweeping, dry brushing, and use of compressed air can cause respirable crystalline silica dust to get

into the air and be inhaled by employees. Therefore, the silica standard limits the use of these cleaning methods to prevent unnecessary exposures to employees. Employers are required to use other cleaning methods such as wet sweeping and HEPA-filtered vacuums, whenever feasible, because such methods reduce employee exposures by preventing silica-containing dust from getting into the air.

Feasibility of Cleaning Methods

In a very limited number of cases, cleaning methods such as wet sweeping or HEPA-filtered vacuums may not be safe or effective. When wet methods or HEPA-filtered vacuuming would not be effective, would cause damage, or would create a hazard in the workplace, the employer is not required to use these cleaning methods. However, even in cases where one of those cleaning methods may not be safe or effective, employers could often use another acceptable method for cleaning. For example, if it is not feasible to wet sweep near electrical equipment, a HEPA-filtered vacuum could be used for cleaning. Therefore, situations in which no acceptable cleaning methods can be used are expected to be very rare.

In those rare cases where the employer needs to use cleaning methods such as dry sweeping, dry brushing, or compressed air, the employer must be able to show why cleaning methods that decrease employee exposures are not feasible.

When Employers Must Follow Housekeeping Practices

The housekeeping requirements in the silica standard apply only where cleaning "could contribute to employee exposure to respirable crystalline silica". This phrase clarifies that employers have to follow the housekeeping requirements of the silica standard only where employees could be exposed to the very small (respirable) crystalline silica particles as are found in industrial sand or are created by high-energy tasks such as grinding stone countertops.

MEDICAL SURVEILLANCE – PARAGRAPH (I) OF THE STANDARD

Medical surveillance is intended to (1) identify respirable crystalline silica-related diseases so that employees with those diseases can take actions to protect their health; (2) determine if an employee has any condition, such as a lung disease, that might make him or her more sensitive to respirable crystalline silica exposure; and (3) determine the employee's fitness to use respirators.

The standard specifies which employees must be offered medical surveillance, when and how often the examinations must offered, and the tests that make up medical examinations. The standard also specifies the information that the employer must give to the physician or other licensed health care professional (PLHCP) who conducts the examinations and the information that the employer must ensure that the PLHCP provides to the employee and employer.

All medical examinations and procedures required by the standard must be performed by a PLHCP. Medical surveillance must be provided at no cost to employees, and at a reasonable time and place. If getting the medical examination requires the employee to travel away from the worksite, the employer is required to cover the cost of travel. The employer must also pay employees for time spent traveling and taking medical examinations.

Which Employees Must be Offered Medical Surveillance

Employers must make an initial or periodic medical examination available to employees who meet the exposure trigger. The triggers for medical surveillance are:

1. Exposures above the PEL for 30 or more days a year from June 23, 2018 through June 22, 2020;
2. Exposures at or above the action level for 30 or more days a year beginning June 23, 2020.

Frequency of Medical Examinations

Employers must offer medical examinations:

- Within 30 days of initial assignment (the day the employee starts working in a job/task in which he or she will be exposed at the trigger point for 30 or more days per year), unless the employee has had an examination that meets the requirements of the silica standard within the last three years.
- Every three years from the employee's last examination that met the requirements of the silica standard, or more frequently if recommended by the PLHCP, if the employee will continue to perform tasks that result in exposures at the trigger for 30 or more days per year.

A PLHCP might recommend more frequent medical examinations based on factors such as high exposure levels or a medical finding, such as an X-ray suggesting silicosis.

Employers must make sure that employees receive a dated copy of the PLHCP's written medical opinion for the employer, and the employee can present that opinion to a new employer as proof of a current medical examination. Employers can determine when they must offer an employee the next periodic medical examination based on the examination date on the written medical opinion.

Tests that Must be Included in the Examination

An initial medical examination provided under the silica standard must consist of:

- A medical and work history that focuses on: past, present, and anticipated exposure to respirable crystalline silica, dust, and other agents affecting the respiratory system; any history of respiratory system dysfunction, including signs and symptoms of respiratory disease (for example, shortness of breath, cough, wheezing); history of tuberculosis; and smoking status and history;
- A physical examination that focuses on the respiratory system;
- A digital or film chest X-ray interpreted according to the International Labour Office (ILO) International Classification of Radiographs of Pneumoconioses by a National Institute for Occupational Safety and Health (NIOSH)-certified B Reader (this involves a certified physician reading the X-ray according to certain procedures to determine if it shows signs of diseases such as silicosis);
- A lung function (spirometry) test that includes forced vital capacity (the total amount of air that is forcefully blown out after taking a full breath), forced expiratory volume in one second (the amount of air forcefully blown out in the first second), and FEV1/FVC ratio (the speed of air that is forcefully blown out), administered by a spirometry technician with a current certificate from a NIOSH-approved spirometry course;
- Testing for latent tuberculosis infection;
- Any other tests deemed appropriate (medically necessary and related to respirable crystalline silica exposure) by the PLHCP.

Periodic examinations include all these tests, with the exception of testing for latent tuberculosis, which is required only for the initial examination.

Employees who must be offered medical surveillance are at risk of developing respirable crystalline silica-related diseases, and the required tests are the minimum tests needed to look for those diseases. More tests may also be needed to address an employee's medical complaint or a finding related to respirable crystalline silica exposure, such as abnormal lung function. The standard gives the PLHCP the flexibility to order additional tests he or she deems appropriate. Employers must make those tests ordered by the PLHCP available to the employee.

Information the Employer Must Provide to the PLHCP

The employer must ensure that the examining PLHCP has a copy of the standard and must provide the PLHCP with:

- A description of the employee's past, current, and future duties as they relate to respirable crystalline silica exposure;
- The employee's past, current, and future levels of exposure to respirable crystalline silica;
- A description of any personal protective equipment used, or to be used, by the employee, including when and for how long the employee has used or will use that equipment; and
- Information from records of employment-related medical examinations previously provided to the employee and currently within the control of the employer.

The PLHCP needs this information to evaluate the employee's health in relation to assigned duties and fitness to use personal protective equipment, such as respirators. The information provided to the PLHCP includes only that within the control of the employer; the employer is not required to obtain information from past employers.

Medical Evaluation Requirements under the Respiratory Protection Standard

Employees who are required to wear respirators must receive medical evaluations required by the Respiratory Protection standard before they are fit tested for a respirator or wear a respirator in the workplace. The medical evaluation for the Respiratory Protection standard can be combined with the medical examination for silica, and employers could have the PLHCP conduct both the evaluation for respirator use and examination for silica at the same time. They could also have employees evaluated for respirator use before they wear a respirator and then offer the silica examination later, according to the required time limits of the silica standard.

Also note that under the Respiratory Protection standard, employers are required to provide another medical evaluation if employees report medical signs or symptoms related to the ability to wear a respirator.

(*see* 29 CFR 1910.134, Respiratory Protection, and OSHA's *Small Entity Compliance Guide for the Respiratory Protection Standard*, Publication #3384).

The PLHCP's Written Medical Report for the Employee

The employer must ensure that the PLHCP explains the results of the medical examination to the employee and gives the employee a written medical report within 30 days of each medical examination performed. Only the employee receives the written medical report, and the employer does not receive a copy of this report. The report must contain:

- A description of the medical examination results, including any medical condition(s) that would place the employee at increased risk of material impairment of health from exposure to respirable crystalline silica

(any health condition that might make the employee more sensitive to exposure). The report must also describe any medical conditions that require further evaluation or treatment;
- Any recommended limitations on the employee's use of respirators;
- Any recommended limitations on respirable crystalline silica exposure; and
- A statement that the employee should be examined by a specialist if the B-reader classifies the chest X-ray provided under the silica standard as 1/0 or higher (X-ray evidence of silicosis in employees exposed to respirable crystalline silica), or if the PLHCP otherwise recommends referral to a specialist.

The PLHCP's Written Medical Opinion for the Employer

The employer must get a written medical opinion from the PLHCP within 30 days of the medical examination. The written opinion must contain only the following information:

- The date of the examination;
- A statement that the examination has met the requirements of the silica standard; and
- Any recommended limitations on the employee's use of respirators.

If the employee gives written authorization, the written medical opinion to the employer must also contain one or both of the following:

- Any recommended limitations on the employee's exposure to respirable crystalline silica;
- A statement that the employee should be examined by a specialist if the B reader classifies the chest X-ray provided under the silica standard as 1/0 or higher (X-ray evidence of silicosis in employees exposed to respirable crystalline silica), or if the PLHCP otherwise recommends referral to a specialist.

The purpose of the employee written authorization requirement is to enhance employee privacy and encourage employees to participate in medical surveillance by minimizing fears about retaliation or discrimination based on medical findings.

Employers must make sure that each employee receives a copy of the written medical opinion within 30 days of each medical examination. The PLHCP can give a copy of the opinion directly to the employee, so long as the time deadline is met. As indicated above, employees can show this opinion to future employers as proof that medical surveillance requirements under the silica standard are current.

Sample Medical Forms in Appendix B of the Standard

Appendix B contains guidelines for PLHCPs and blank sample forms for the medical report for the employee, the medical opinion for the employer, and an authorization form to allow limitations on respirable crystalline silica exposure or recommendations for a specialist examination to be reported to the employer. Employers must make sure that PLHCPs who will conduct medical examinations required by the silica standard have a copy of the standard, including Appendix B. The purpose of Appendix B is to give PLHCPs medical information and guidance to help them conduct medical examinations that meet the requirements of the silica standard.

Examples of completed forms are included in this guide. Sample Form 1 is a sample of the written medical report that the PLHCP provides to the employee. The employer does not receive a copy of the written medical report. Sample Form 2 is a sample of the written medical opinion that the PLHCP provides to the employer. The PLHCP indicates the type of examination and recommendations on use of a respirator. If the employee signs the written authorization (Sample Form 3) allowing the PLHCP to release further information to the employer, the PLHCP must include any recommend limitations on exposure to respirable crystalline silica and/or any referral to a specialist.

SAMPLE FORM 1: WRITTEN MEDICAL REPORT FOR EMPLOYEE

EMPLOYEE NAME: Joe Smith **DATE OF EXAMINATION**: July 1, 2018

TYPE OF EXAMINATION:
[x] Initial examination [ ] Periodic examination [ ] Specialist examination
[ ] Other: _____

RESULTS OF MEDICAL EXAMINATION:

Physical Examination –	[x] Normal	[ ] Abnormal (see below)	[ ] Not performed
Chest X-Ray –	[x] Normal	[ ] Abnormal (see below)	[ ] Not performed
Breathing Test (Spirometry) –	[ ] Normal	[x] Abnormal (see below)	[ ] Not performed
Test for Tuberculosis –	[x] Normal	[ ] Abnormal (see below)	[ ] Not performed
Other:_____	[ ] Normal	[ ] Abnormal (see below)	[ ] Not performed

Results reported as abnormal: Breathing test (Spirometry) shows an obstructive pattern.

_____

[x] Your health may be at increased risk from exposure to respirable crystalline silica due to the following:
Continued unprotected exposure to respirable crystalline silica may further damage your lungs.

RECOMMENDATIONS:
[ ] No limitations on respirator use
[x] Recommended limitations on use of respirator: A powered air purifying respirator (PAPR) is the only type of respirator you can safely wear. A PAPR will give you higher protection from silica exposure and will decrease strain on your heart and lungs.
[x] Recommended limitations on exposure to respirable crystalline silica: Ideally, you may want to consider a position that doesn't involve exposure to substances hazardous to your lungs, such as respirable crystalline silica. If that is not possible, be sure to always wear a respirator when needed to protect your lungs.

Dates for recommended limitations, if applicable: Indefinitely unless otherwise indicated by a specialist.

[x] I recommend that you be examined by a Board Certified Specialist in Pulmonary Disease or Occupational Medicine

[x] Other recommendations*: See your personal physician about the mole on your neck.

_____

Your next periodic examination for silica exposure should be in: [ ] 3 years [x] Other: 1 year, July 1, 2019

Examining Provider: Dr. Jones Date: July 1, 2018
(signature)
Provider Name: Dr. Jones Health Clinic
Office Address: 1111 Main Street, Washington, DC Office Phone: 123-456-7890

*These findings may not be related to respirable crystalline silica exposure or may not be work-related, and therefore may not be covered by the employer. These findings may necessitate follow-up and treatment by your personal physician.

Respirable Crystalline Silica standard (§ 1910.1053 or 1926.1153)

SAMPLE FORM 2: WRITTEN MEDICAL OPINION FOR EMPLOYER

EMPLOYER: Glass, Inc.

EMPLOYEE NAME: Joe Smith **DATE OF EXAMINATION:** July 1, 2018

TYPE OF EXAMINATION:
[x] Initial examination [ ] Periodic examination [ ] Specialist examination
[ ] Other: _____

USE OF RESPIRATOR:
[ ] No limitations on respirator use
[x] Recommended limitations on use of respirator: A powered air purifying respirator (PAPR) is the only type of respirator Mr. Smith can safely wear.

Dates for recommended limitations, if applicable: Indefinitely, unless otherwise recommended by specialist

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The employee has provided written authorization for disclosure of the following to the employer (if applicable):

[x] This employee should be examined by an American Board Certified Specialist in Pulmonary Disease or Occupational Medicine
[ ] Recommended limitations on exposure to respirable crystalline silica:_____

Dates for exposure limitations noted above: _____ to _____
MM/DD/YYYY MM/DD/YYYY

NEXT PERIODIC EVALUATION: [ ] 3 years [x] Other: 1 year, July 1, 2019

Examining Provider: Dr. Jones Date: July 1, 2018
(signature)
Provider Name: Dr. Jones Health Clinic Provider's specialty: None, general practitioner

Office Address: 1111 Main Street, Washington, DC Office Phone: 123-456-7890

[x] I attest that the results have been explained to the employee.

The following is required to be checked by the Physician or other Licensed Health Care Professional (PLHCP):
[x] I attest that this medical examination has met the requirements of the medical surveillance section of the OSHA Respirable Crystalline Silica standard (§ 1910.1053(h) or 1926.1153(h)).

SAMPLE FORM 3: AUTHORIZATION FOR CRYSTALLINE SILICA OPINION TO EMPLOYER

This medical examination for exposure to crystalline silica could reveal a medical condition that results in recommendations for (1) limitations on respirator use, (2) limitations on exposure to crystalline silica, or (3) examination by a specialist in pulmonary disease or occupational medicine. Recommended limitations on respirator use will be included in the written opinion to the employer. If you want your employer to know about limitations on crystalline silica exposure or recommendations for a specialist examination, you will need to give authorization for the written opinion to the employer to include one or both of those recommendations.

I hereby authorize the opinion to the employer to contain the following information, if relevant (please check all that apply):

☐ Recommendations for limitations on crystalline silica exposure

☒ Recommendation for a specialist examination

OR

☐ I do not authorize the opinion to the employer to contain anything other than recommended limitations on respirator use.

Please read and initial:

_X_ I understand that if I do not authorize my employer to receive the recommendation for specialist examination, the employer will not be responsible for arranging and covering costs of a specialist examination under the OSHA standard for respirable crystalline silica.

__Joe Smith_____
Name (printed)

__*Joe Smith*_____ ___July 1, 2018_____
Signature Date

Additional Examinations by a Specialist

The employer must make the specialist examination available within 30 days of receiving the written medical opinion that includes the PLHCP's recommendation for a specialist examination. The specialists must be either an American Board Certified Specialist in Pulmonary Disease or an American Board Certified Specialist in Occupational Medicine.

The employer must ensure the specialist:

- Receives the same information that the employer is required to provide the PLHCP (*see* above);
- Explains the results of the medical examination to the employee and provides each employee with a written medical report within 30 days of the examination; and
- Provides the employer a written medical opinion within 30 days of the examination.

The specialist's written medical report to the employee must contain the following information:

- A description of the medical examination results, including any medical condition(s) that may make an employee more sensitive to respirable crystalline silica exposure and any medical conditions that require further evaluation or treatment;
- Any recommended limitations on the employee's use of respirators; and
- Any recommended limitations on respirable crystalline silica exposure.

The specialist's written medical opinion for the employer must include only the following:

- The date of the examination; and
- Any recommended limitations on the employee's use of respirators.

If the employee gives written authorization, the written opinion to the employer must also contain any recommended limitations on the employee's exposure to respirable crystalline silica.

COMMUNICATION OF HAZARDS – PARAGRAPH (J) OF THE STANDARD

Employers must train and inform employees covered by the silica standard about respirable crystalline silica hazards and the methods the employer uses to limit their exposures to those hazards. Employers must cover the cost of training and must pay employees for the time spent in training.

OSHA's Hazard Communication Standard

Employers must also comply with OSHA's Hazard Communication standard (HCS) (29 CFR 1910.1200). HCS requires employers to inform employees about hazardous chemicals in the workplace, such as respirable crystalline silica, through their written hazard communication programs. Written hazard communication programs must describe how requirements for container labels, safety data sheets (SDSs), and employee training will be met. As part of their hazard communication program for respirable crystalline silica, employers must address at least these health hazards: cancer, lung effects, immune system effects, and kidney effects.

Under the HCS, employers must:

- Inform employees about the general requirements of HCS, as well as where and how they can view the written hazard communication program, lists of hazardous chemicals, and SDSs.
- Train employees on how the presence or release of hazardous chemicals in the work area is detected; in the case of respirable crystalline silica, this could include methods the employer uses to measure exposures, such as air sampling or objective data. Employers can train employees to recognize that an increase in visible dust is a sign that a control may not be working properly.
- Train employees on the details of the workplace-specific hazard communication program developed by the employer, such as container labels, the workplace labeling system, SDSs (including the order in which the information is presented), and how employees can get and use hazard information.

See OSHA's *HAZARD COMMUNICATION: Small Entity Compliance Guide for Employers that Use Hazardous Chemicals [OSHA Publication # 3695]* for more information on preparing a written hazard communication program and employer requirements for labeling, SDSs, and training.

Signs at Entrances to Regulated Areas

The employer must post a sign at each entrance to regulated areas. The sign must include the following wording:

DANGER
RESPIRABLE CRYSTALLINE SILICA
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION IN THIS AREA
AUTHORIZED PERSONNEL ONLY

Training Topics

The employer must ensure that employees trained under the silica standard can demonstrate knowledge and understanding of at least:

1. Health hazards associated with respirable crystalline silica exposure. For respirable crystalline silica, the health hazards include: cancer, lung effects, immune system effects, and kidney effects.
2. Specific workplace tasks that could expose employees to respirable crystalline silica.

3. Specific measures the employer is implementing to protect employees from respirable crystalline silica exposure, including engineering controls, work practices, and respirators to be used. This training must be specific for the workplace and task that each employee performs. In general industry and maritime, training subjects would commonly include:

   - Signs that the controls may not be working effectively (*e.g.*, visible dust emission).
   - Work practices needed for the controls to function effectively (*e.g.*, not opening windows near local exhaust sources, positioning the local exhaust hood directly over the exposure source).

   If employees covered by the general industry and maritime standard operate equipment with built-in controls that are under their control, those employees are required to demonstrate knowledge and understanding of the full and proper implementation of those controls.

4. The contents of the Respirable Crystalline Silica standard. This would involve a description of the standard's requirements.

5. The purpose and a description of the medical surveillance program required under the standard. Topics that employers could communicate to their employees as part of this training include:

   - That employers must offer medical examinations to employees who meet the exposure trigger for 30 or more days a year;
   - That employers must offer medical examinations at no cost to the employee, including additional silica-related tests or specialist examinations recommended by the PLHCP;
   - The types of tests included in the medical examinations;
   - Symptoms associated with respirable crystalline silica-related diseases;
   - Information that must be included in the written medical report for the employee versus the written medical opinion for the employer;
   - Information that must not be included in written medical opinion to the employer without written authorization from the employee (recommendations for limitations on exposures to silica and for specialist referrals);
   - The importance of keeping a copy of the written medical opinion to the employer as proof of a current medical examination to avoid unnecessary testing; and
   - That employers cannot retaliate or discriminate against employees for participating in medical surveillance.

The employer is not required to provide all required training if an employee is already able to demonstrate knowledge and understanding of training topics such as health hazards, the contents of the silica standard, or medical surveillance requirements. However, some site-specific or employer-specific training is always necessary, such as training on specific tasks that could result in exposures in that workplace and specific controls or work practices that the employer is using.

When Employees Must be Trained

Employees must be trained at the time they are assigned to a position involving exposure to respirable crystalline silica.

Additional training must be provided as often as necessary to ensure that employees know and understand respirable crystalline silica hazards and the protections available in their workplace. Examples of when additional training would be required include:

- When the employer asks an employee to perform a task that is new to that employee;
- When the employer introduces new protections;
- When an employee is working in a manner that suggests he or she has forgotten what was learned in training.

Training Methods

The silica standard does not require the employer to use any particular method for training employees. Employers could use hands-on training, videotapes, slide presentations, classroom instruction, informal discussions during safety meetings, written materials, or any combination of these methods to train employees.

In order for employees to demonstrate knowledge and understanding of the training subjects, training must be done in a manner and language that employees understand. This may mean, for example, providing materials, instruction, or assistance in Spanish rather than English for Spanish-speaking employees who do not understand English, and using methods other than printed reading materials if the employee is not able to read.

To ensure that employees understand the material presented during training, it is critical that trainees have the opportunity to ask questions and receive answers if they do not fully understand the material that is presented to them. When videotape presentations or computer-based programs are used, this requirement may be met by having a qualified trainer available to address questions after the presentation, or providing a telephone hotline so that trainees will have direct access to a qualified trainer.

Employers can determine if employees know and understand the training topics through discussion of the required training subjects, written tests, or oral quizzes.

Making a Copy of the Standard Available

Employers must make a copy of the Respirable Crystalline Silica standard available at no cost to each employee covered by the standard. This could simply involve allowing employees to view a printed or electronic copy in a reasonable location.

RECORDKEEPING – PARAGRAPH (K) OF THE STANDARD

Records can demonstrate employer compliance with the standard, and can assist in diagnosing and identifying workplace-related illnesses. Therefore, employers are required to make and keep accurate records of air monitoring data and objective data used to assess employee exposures to respirable crystalline silica under the standard, as well as records of medical surveillance provided under the standard.

Air Monitoring Data

Employers must make and keep an accurate record of all air monitoring performed to comply with the standard. The record must indicate:

- The date of the measurement for each sample taken;
- The task monitored;
- Sampling and analytical methods used;
- The number, duration, and results of samples taken;
- The identity of the laboratory that performed the analysis;
- The type of personal protective equipment used (*e.g.*, type of respirators worn); and
- The name, social security number, and job classification of all employees represented by the monitoring, indicating which employees were actually monitored.

Objective Data

When an employer relies on objective data to comply with the silica standard, the employer must make and keep an accurate record of the objective data. The record must include at least:

- The crystalline silica-containing material in question;
- The source of the objective data;
- The testing protocol and results of testing;
- A description of the process, task, or activity on which the objective data were based; and
- Any other data relevant to the process, task, activity, material, or exposures on which the objective data are based.

Medical Surveillance

The employer must make and keep an accurate record for each employee provided medical surveillance under the standard. The record must include the following information about the employee:

- Name and social security number;
- A copy of the PLHCPs' and specialists' written opinions; and
- A copy of the information that the employer is required to provide to the PLHCPs and specialists (*i.e.*, a description of the employee's former, current, and anticipated duties as they relate to crystalline silica exposure; a description of the employee's former, current, and anticipated respirable crystalline silica exposure levels; a description of the personal protective equipment used by the employee; and information from previous employment-related medical examinations that is currently within the control of the employer).

Keeping and Making Medical Records Available

Exposure and medical records must be kept and made available to employees, their representatives, and OSHA in accordance with OSHA's access to employee exposure and medical records regulation.

OSHA's Access to Employee Exposure and Medical Records Regulation

A separate OSHA regulation (29 CFR 1910.1020, Access to Employee Exposure and Medical Records) addresses requirements for maintaining exposure and medical records. In general, exposure records (including air monitoring and objective data) must be kept for at least 30 years, and medical records must be kept for at least the duration of employment plus 30 years. It is necessary to keep these records for extended periods because silica-related diseases such as cancer often cannot be detected until several decades after exposure. However, if an employee works for an employer for less than one year, the employer does not have to keep the medical records after employment ends, as long as the employer gives those records to the employee.

DATES – PARAGRAPH (L) OF THE STANDARD

General industry and maritime employers must comply with all requirements of the standard by June 23, 2018, except for phase-in dates for medical surveillance and for engineering controls in the oil and gas industry.

- The obligation for employers to offer medical surveillance begins on June 23, 2018 for employees who will be exposed above the PEL of 50 µg/m^3 for 30 or more days per year and on June 23, 2020 for employees who will be exposed at or above the action level of 25 µg/m^3 for 30 or more days per year. This schedule initiates medical surveillance efforts for those employees who are at greatest risk and provides most employers time to fully evaluate installed engineering controls and determine which employees meet the action level trigger for medical surveillance.
- The obligation for engineering controls for hydraulic fracturing operations in the oil and gas industry begins on June 23, 2021. In the period between June 23, 2018 and June 23, 2021, employers must comply with all other requirements of the standard for hydraulic fracturing operations, including requirements for respiratory protection to protect employees exposed to respirable crystalline silica at levels that exceed the PEL of 50 µg/m^3.

Prior to June 23, 2018, the previous PEL (a formula that is approximately equivalent to 100 µg/m^3 of respirable crystalline silica as an 8-hour TWA) remains in effect for general industry employers.

APPENDIX I: OSHA RESPIRABLE CRYSTALLINE SILICA STANDARD FOR GENERAL INDUSTRY AND MARITIME

§1910.1053 Respirable crystalline silica

(a) *Scope and application*. (1) This section applies to all occupational exposures to respirable crystalline silica, except:

(i) Construction work as defined in 29 CFR 1910.12(b) (occupational exposures to respirable crystalline silica in construction work are covered under 29 CFR 1926.1153);

(ii) Agricultural operations covered under 29 CFR part 1928; and

(iii) Exposures that result from the processing of sorptive clays.

(2) This section does not apply where the employer has objective data demonstrating that employee exposure to respirable crystalline silica will remain below 25 micrograms per cubic meter of air (25 μg/m^3) as an 8-hour time-weighted average (TWA) under any foreseeable conditions.

(3) This section does not apply if the employer complies with 29 CFR 1926.1153 and:

(i) The task performed is indistinguishable from a construction task listed on Table 1 in paragraph (c) of 29 CFR 1926.1153; and

(ii) The task will not be performed regularly in the same environment and conditions.

(b) *Definitions*. For the purposes of this section the following definitions apply:

Action level means a concentration of airborne respirable crystalline silica of 25 μg/m^3, calculated as an 8-hour TWA.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Director means the Director of the National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee.

Employee exposure means the exposure to airborne respirable crystalline silica that would occur if the employee were not using a respirator.

High-efficiency particulate air [HEPA] filter means a filter that is at least 99.97 percent efficient in removing mono-dispersed particles of 0.3 micrometers in diameter.

Objective data means information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to respirable crystalline silica associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions closely resembling or with a higher exposure potential than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

Physician or other licensed health care professional [PLHCP] means an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the particular health care services required by paragraph (i) of this section.

Regulated area means an area, demarcated by the employer, where an employee's exposure to airborne concentrations of respirable crystalline silica exceeds, or can reasonably be expected to exceed, the PEL.

Respirable crystalline silica means quartz, cristobalite, and/or tridymite contained in

airborne particles that are determined to be respirable by a sampling device designed to meet the characteristics for respirable-particle-size-selective samplers specified in the International Organization for Standardization (ISO) 7708:1995: Air Quality – Particle Size Fraction Definitions for Health-Related Sampling.

Specialist means an American Board Certified Specialist in Pulmonary Disease or an American Board Certified Specialist in Occupational Medicine.

This section means this respirable crystalline silica standard, 29 CFR 1910.1053.

(c) *Permissible exposure limit (PEL).* The employer shall ensure that no employee is exposed to an airborne concentration of respirable crystalline silica in excess of 50 μg/m^3, calculated as an 8-hour TWA.

(d) *Exposure assessment*—(1) *General.* The employer shall assess the exposure of each employee who is or may reasonably be expected to be exposed to respirable crystalline silica at or above the action level in accordance with either the performance option in paragraph (d)(2) or the scheduled monitoring option in paragraph (d)(3) of this section.

(2) *Performance option.* The employer shall assess the 8-hour TWA exposure for each employee on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to respirable crystalline silica.

(3) *Scheduled monitoring option.* (i) The employer shall perform initial monitoring to assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, in each work area. Where several employees perform the same tasks on the same shift and in the same work area, the employer may sample a representative fraction of these employees in order to meet this requirement. In representative sampling, the employer shall sample the employee(s) who are expected to have the highest exposure to respirable crystalline silica.

(ii) If initial monitoring indicates that employee exposures are below the action level, the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring.

(iii) Where the most recent exposure monitoring indicates that employee exposures are at or above the action level but at or below the PEL, the employer shall repeat such monitoring within six months of the most recent monitoring.

(iv) Where the most recent exposure monitoring indicates that employee exposures are above the PEL, the employer shall repeat such monitoring within three months of the most recent monitoring.

(v) Where the most recent (non-initial) exposure monitoring indicates that employee exposures are below the action level, the employer shall repeat such monitoring within six months of the most recent monitoring until two consecutive measurements, taken 7 or more days apart, are below the action level, at which time the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring, except as otherwise provided in paragraph (d)(4) of this section.

(4) *Reassessment of exposures.* The employer shall reassess exposures whenever a change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the action level, or when the employer has any reason to believe that new or additional exposures at or above the action level have occurred.

(5) *Methods of sample analysis.* The employer shall ensure that all samples taken to satisfy

the monitoring requirements of paragraph (d) of this section are evaluated by a laboratory that analyzes air samples for respirable crystalline silica in accordance with the procedures in Appendix A to this section.

(6) *Employee notification of assessment results*. (i) Within 15 working days after completing an exposure assessment in accordance with paragraph (d) of this section, the employer shall individually notify each affected employee in writing of the results of that assessment or post the results in an appropriate location accessible to all affected employees.

(ii) Whenever an exposure assessment indicates that employee exposure is above the PEL, the employer shall describe in the written notification the corrective action being taken to reduce employee exposure to or below the PEL.

(7) *Observation of monitoring*. (i) Where air monitoring is performed to comply with the requirements of this section, the employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to respirable crystalline silica.

(ii) When observation of monitoring requires entry into an area where the use of protective clothing or equipment is required for any workplace hazard, the employer shall provide the observer with protective clothing and equipment at no cost and shall ensure that the observer uses such clothing and equipment.

(e) *Regulated areas*—(1) *Establishment*. The employer shall establish a regulated area wherever an employee's exposure to airborne concentrations of respirable crystalline silica is, or can reasonably be expected to be, in excess of the PEL.

(2) *Demarcation*. (i) The employer shall demarcate regulated areas from the rest of the workplace in a manner that minimizes the number of employees exposed to respirable crystalline silica within the regulated area.

(ii) The employer shall post signs at all entrances to regulated areas that bear the legend specified in paragraph (j)(2) of this section.

(3) *Access*. The employer shall limit access to regulated areas to:

(A) Persons authorized by the employer and required by work duties to be present in the regulated area;

(B) Any person entering such an area as a designated representative of employees for the purpose of exercising the right to observe monitoring procedures under paragraph (d) of this section; and

(C) Any person authorized by the Occupational Safety and Health Act or regulations issued under it to be in a regulated area.

(4) *Provision of respirators*. The employer shall provide each employee and the employee's designated representative entering a regulated area with an appropriate respirator in accordance with paragraph (g) of this section and shall require each employee and the employee's designated representative to use the respirator while in a regulated area.

(f) *Methods of compliance*—(1) *Engineering and work practice controls*. The employer shall use engineering and work practice controls to reduce and maintain employee exposure to respirable crystalline silica to or below the PEL, unless the employer can demonstrate that such controls are not feasible. Wherever such feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PEL, the employer shall nonetheless use them to reduce employee exposure to the lowest feasible level and shall supplement them with the use of respiratory protection that complies with the requirements of paragraph (g) of this section.

(2) *Written exposure control plan*. (i) The employer shall establish and implement a written exposure control plan that contains at least the following elements:

(A) A description of the tasks in the workplace that involve exposure to respirable crystalline silica;

(B) A description of the engineering controls, work practices, and respiratory protection used to limit employee exposure to respirable crystalline silica for each task; and

(C) A description of the housekeeping measures used to limit employee exposure to respirable crystalline silica.

(ii) The employer shall review and evaluate the effectiveness of the written exposure control plan at least annually and update it as necessary.

(iii) The employer shall make the written exposure control plan readily available for examination and copying, upon request, to each employee covered by this section, their designated representatives, the Assistant Secretary and the Director.

(3) *Abrasive blasting*. In addition to the requirements of paragraph (f)(1) of this section, the employer shall comply with other OSHA standards, when applicable, such as 29 CFR 1910.94 (Ventilation), 29 CFR 1915.34 (Mechanical paint removers), and 29 CFR 1915 Subpart I (Personal Protective Equipment), where abrasive blasting is conducted using crystalline silica-containing blasting agents, or where abrasive blasting is conducted on substrates that contain crystalline silica.

(g) *Respiratory protection*—(1) *General*. Where respiratory protection is required by this section, the employer must provide each employee an appropriate respirator that complies with the requirements of this paragraph and 29 CFR 1910.134. Respiratory protection is required:

(i) Where exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls;

(ii) Where exposures exceed the PEL during tasks, such as certain maintenance and repair tasks, for which engineering and work practice controls are not feasible;

(iii) During tasks for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL; and

(iv) During periods when the employee is in a regulated area.

(2) *Respiratory protection program*. Where respirator use is required by this section, the employer shall institute a respiratory protection program in accordance with 29 CFR 1910.134.

(h) *Housekeeping*. (1) The employer shall not allow dry sweeping or dry brushing where such activity could contribute to employee exposure to respirable crystalline silica unless wet sweeping, HEPA-filtered vacuuming or other methods that minimize the likelihood of exposure are not feasible.

(2) The employer shall not allow compressed air to be used to clean clothing or surfaces where such activity could contribute to employee exposure to respirable crystalline silica unless:

(i) The compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air; or

(ii) No alternative method is feasible.

(i) *Medical surveillance*—(1) *General*. (i) The employer shall make medical surveillance available at no cost to the employee, and at a reasonable time and place, for each employee who will be occupationally exposed to respirable crystalline silica at or above the action level for 30 or more days per year.

(ii) The employer shall ensure that all medical examinations and procedures required by this section are performed by a PLHCP as defined in paragraph (b) of this section.

(2) *Initial examination*. The employer shall make available an initial (baseline) medical examination within 30 days after initial assignment, unless the employee has received a medical examination that meets the requirements of this section within the last three years. The examination shall consist of:

(i) A medical and work history, with emphasis on: past, present, and anticipated exposure to respirable crystalline silica, dust, and other agents affecting the respiratory system; any history of respiratory system dysfunction, including signs and symptoms of respiratory disease (*e.g.*, shortness of breath, cough, wheezing); history of tuberculosis; and smoking status and history;

(ii) A physical examination with special emphasis on the respiratory system;

(iii) A chest X-ray (a single posteroanterior radiographic projection or radiograph of the chest at full inspiration recorded on either film (no less than 14 x 17 inches and no more than 16 x 17 inches) or digital radiography systems), interpreted and classified according to the International Labour Office (ILO) International Classification of Radiographs of Pneumoconioses by a NIOSH-certified B Reader;

(iv) A pulmonary function test to include forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) and FEV1/FVC ratio, administered by a spirometry technician with a current certificate from a NIOSH-approved spirometry course;

(v) Testing for latent tuberculosis infection; and

(vi) Any other tests deemed appropriate by the PLHCP.

(3) *Periodic examinations*. The employer shall make available medical examinations that include the procedures described in paragraph (i)(2) of this section (except paragraph (i)(2)(v)) at least every three years, or more frequently if recommended by the PLHCP.

(4) *Information provided to the PLHCP*. The employer shall ensure that the examining PLHCP has a copy of this standard, and shall provide the PLHCP with the following information:

(i) A description of the employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to respirable crystalline silica;

(ii) The employee's former, current, and anticipated levels of occupational exposure to respirable crystalline silica;

(iii) A description of any personal protective equipment used or to be used by the employee, including when and for how long the employee has used or will use that equipment; and

(iv) Information from records of employment-related medical examinations previously provided to the employee and currently within the control of the employer.

(5) *PLHCP's written medical report for the employee*. The employer shall ensure that the PLHCP explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of each medical examination performed. The written report shall contain:

(i) A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to respirable crystalline silica and any medical conditions that require further evaluation or treatment;

(ii) Any recommended limitations on the employee's use of respirators;

(iii) Any recommended limitations on the employee's exposure to respirable crystalline silica; and

(iv) A statement that the employee should be examined by a specialist (pursuant to paragraph (i)(7) of this section) if the chest X-ray provided in accordance with this section is classified as 1/0 or higher by the B Reader, or if referral to a specialist is otherwise deemed appropriate by the PLHCP.

(6) *PLHCP's written medical opinion for the employer*. (i) The employer shall obtain a written medical opinion from the PLHCP within 30 days of the medical examination. The written opinion shall contain only the following:

(A) The date of the examination;

(B) A statement that the examination has met the requirements of this section; and

(C) Any recommended limitations on the employee's use of respirators.

(ii) If the employee provides written authorization, the written opinion shall also contain either or both of the following:

(A) Any recommended limitations on the employee's exposure to respirable crystalline silica;

(B) A statement that the employee should be examined by a specialist (pursuant to paragraph (i)(7) of this section) if the chest X-ray provided in accordance with this section is classified as 1/0 or higher by the B Reader, or if referral to a specialist is otherwise deemed appropriate by the PLHCP.

(iii) The employer shall ensure that each employee receives a copy of the written medical opinion described in paragraph (i)(6)(i) and (ii) of this section within 30 days of each medical examination performed.

(7) *Additional examinations*. (i) If the PLHCP's written medical opinion indicates that an employee should be examined by a specialist, the employer shall make available a medical examination by a specialist within 30 days after receiving the PLHCP's written opinion.

(ii) The employer shall ensure that the examining specialist is provided with all of the information that the employer is obligated to provide to the PLHCP in accordance with paragraph (i)(4) of this section.

(iii) The employer shall ensure that the specialist explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of the examination. The written report shall meet the requirements of paragraph (i)(5) (except paragraph (i)(5)(iv)) of this section.

(iv) The employer shall obtain a written opinion from the specialist within 30 days of the medical examination. The written opinion shall meet the requirements of paragraph (i)(6) (except paragraph (i)(6)(i)(B) and (i)(6)(ii)(B)) of this section.

(j) *Communication of respirable crystalline silica hazards to employees—(1) Hazard communication*. The employer shall include respirable crystalline silica in the program established to comply with the hazard communication standard (HCS) (29 CFR 1910.1200). The employer shall ensure that each employee has access to labels on containers of crystalline silica and safety data sheets, and is trained in accordance with the provisions of HCS and paragraph (j)(3) of this section. The employer shall ensure that at least the following hazards are addressed: Cancer, lung effects, immune system effects, and kidney effects.

(2) *Signs*. The employer shall post signs at all entrances to regulated areas that bear the following legend:

DANGER
RESPIRABLE CRYSTALLINE SILICA
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION IN THIS AREA
AUTHORIZED PERSONNEL ONLY

(3) *Employee information and training*. (i) The employer shall ensure that each employee covered by this section can demonstrate knowledge and understanding of at least the following:

(A) The health hazards associated with exposure to respirable crystalline silica;

(B) Specific tasks in the workplace that could result in exposure to respirable crystalline silica;

(C) Specific measures the employer has implemented to protect employees from exposure to respirable crystalline silica, including engineering controls, work practices, and respirators to be used;

(D) The contents of this section; and

(E) The purpose and a description of the medical surveillance program required by paragraph (i) of this section.

(ii) The employer shall make a copy of this section readily available without cost to each employee covered by this section.

(k) *Recordkeeping*—(1) *Air monitoring data*. (i) The employer shall make and maintain an accurate record of all exposure measurements taken to assess employee exposure to respirable crystalline silica, as prescribed in paragraph (d) of this section.

(ii) This record shall include at least the following information:

(A) The date of measurement for each sample taken;

(B) The task monitored;

(C) Sampling and analytical methods used;

(D) Number, duration, and results of samples taken;

(E) Identity of the laboratory that performed the analysis;

(F) Type of personal protective equipment, such as respirators, worn by the employees monitored; and

(G) Name, social security number, and job classification of all employees represented by the monitoring, indicating which employees were actually monitored.

(iii) The employer shall ensure that exposure records are maintained and made available in accordance with 29 CFR 1910.1020.

(2) *Objective data*. (i) The employer shall make and maintain an accurate record of all objective data relied upon to comply with the requirements of this section.

(ii) This record shall include at least the following information:

(A) The crystalline silica-containing material in question;

(B) The source of the objective data;

(C) The testing protocol and results of testing;

(D) A description of the process, task, or activity on which the objective data were based; and

(E) Other data relevant to the process, task, activity, material, or exposures on which the objective data were based.

(iii) The employer shall ensure that objective data are maintained and made available in accordance with 29 CFR 1910.1020.

(3) *Medical surveillance*. (i) The employer shall make and maintain an accurate record for each employee covered by medical surveillance under paragraph (i) of this section.

(ii) The record shall include the following information about the employee:

(A) Name and social security number;

(B) A copy of the PLHCPs' and specialists' written medical opinions; and

(C) A copy of the information provided to the PLHCPs and specialists.

(iii) The employer shall ensure that medical records are maintained and made available in accordance with 29 CFR 1910.1020.

(l) *Dates*. (1) This section is effective June 23, 2016.

(2) Except as provided for in paragraphs (l)(3) and (4) of this section, all obligations of this section commence June 23, 2018.

(3) For hydraulic fracturing operations in the oil and gas industry:

(i) All obligations of this section, except obligations for medical surveillance in paragraph (i)(1)(i) and engineering controls in paragraph (f)(1) of this section, commence June 23, 2018;

(ii) Obligations for engineering controls in paragraph (f)(1) of this section commence June 23, 2021; and

(iii) Obligations for medical surveillance in paragraph (i)(1)(i) commence in accordance with paragraph (l)(4) of this section.

(4) The medical surveillance obligations in paragraph (i)(1)(i) commence on June 23, 2018, for employees who will be occupationally exposed to respirable crystalline silica above the PEL for 30 or more days per year. Those obligations commence June 23, 2020, for employees who will be occupationally exposed to respirable crystalline silica at or above the action level for 30 or more days per year.

Appendix A to § 1910.1053 – Methods of Sample Analysis.

This appendix specifies the procedures for analyzing air samples for respirable crystalline silica, as well as the quality control procedures that employers must ensure that laboratories use when performing an analysis required under 29 CFR 1926.1153 (d)(2)(v). Employers must ensure that such a laboratory:

1. Evaluates all samples using the procedures specified in one of the following analytical methods: OSHA ID-142; NMAM 7500; NMAM 7602; NMAM 7603; MSHA P-2; or MSHA P-7;

2. Is accredited to ANS/ISO/IEC Standard 17025:2005 with respect to crystalline silica analyses by a body that is compliant with ISO/IEC Standard 17011:2004 for implementation of quality assessment programs;

3. Uses the most current National Institute of Standards and Technology (NIST) or NIST traceable standards for instrument calibration or instrument calibration verification;

4. Implements an internal quality control (QC) program that evaluates analytical uncertainty and provides employers with estimates of sampling and analytical error;

5. Characterizes the sample material by identifying polymorphs of respirable crystalline silica present, identifies the presence of any interfering compounds that might affect the analysis, and makes any corrections necessary in order to obtain accurate sample analysis; and

6. Analyzes quantitatively for crystalline silica only after confirming that the sample matrix is free of uncorrectable analytical interferences, corrects for analytical interferences, and uses a method that meets the following performance specifications:

6.1 Each day that samples are analyzed, performs instrument calibration checks with standards that bracket the sample concentrations;

6.2 Uses five or more calibration standard levels to prepare calibration curves and ensures that standards are distributed through the calibration range in a manner that accurately reflects the underlying calibration curve; and

6.3 Optimizes methods and instruments to obtain a quantitative limit of detection that represents a value no higher than 25 percent of the PEL based on sample air volume.

Appendix B to § 1910.1053 – Medical Surveillance Guidelines.

Introduction

The purpose of this Appendix is to provide medical information and recommendations to aid physicians and other licensed health care professionals (PLHCPs) regarding compliance with the medical surveillance provisions of the respirable crystalline silica standard (29 CFR 1926.1153). Appendix B is for informational and guidance purposes only and none of the statements in Appendix B should be construed as imposing a mandatory requirement on employers that is not otherwise imposed by the standard.

Medical screening and surveillance allow for early identification of exposure-related health effects in individual employee and groups of employees, so that actions can be taken to both avoid further exposure and prevent or address adverse health outcomes. Silica-related diseases can be fatal, encompass a variety of target organs, and may have public health consequences when considering the increased risk of a latent tuberculosis (TB) infection becoming active. Thus, medical surveillance of silica-exposed employees requires that PLHCPs have a thorough knowledge of silica-related health effects.

This Appendix is divided into seven sections. Section 1 reviews silica-related diseases, medical responses, and public health responses. Section 2 outlines the components of the medical surveillance program for employees exposed to silica. Section 3 describes the roles and responsibilities of the PLHCP implementing the program and of other medical specialists and public health professionals. Section 4 provides a discussion of considerations, including confidentiality. Section 5 provides a list of additional resources and Section 6 lists references. Section 7 provides sample forms for the written medical report for the employee, the written medical opinion for the employer and the written authorization.

1. Recognition of Silica-related Diseases.

1.1. Overview. The term "silica" refers specifically to the compound silicon dioxide (SiO2). Silica is a major component of sand, rock, and mineral ores. Exposure to fine (respirable size) particles of crystalline forms of silica is associated with adverse health effects, such as silicosis, lung cancer, chronic obstructive pulmonary disease (COPD), and activation of latent TB infections. Exposure to respirable crystalline silica can occur in industry settings such as foundries, abrasive blasting operations, paint manufacturing, glass and concrete product manufacturing, brick making, china and pottery manufacturing, manufacturing of plumbing fixtures, and many construction activities including highway repair, masonry, concrete work, rock drilling, and tuck-pointing. New uses of silica continue to emerge. These include countertop manufacturing, finishing, and installation (Kramer et al. 2012; OSHA 2015) and hydraulic fracturing in the oil and gas industry (OSHA 2012).

Silicosis is an irreversible, often disabling, and sometimes fatal fibrotic lung disease. Progression of silicosis can occur despite removal from further exposure. Diagnosis of silicosis requires a history of exposure to silica

and radiologic findings characteristic of silica exposure. Three different presentations of silicosis (chronic, accelerated, and acute) have been defined. Accelerated and acute silicosis are much less common than chronic silicosis. However, it is critical to recognize all cases of accelerated and acute silicosis because these are life-threatening illnesses and because they are caused by substantial overexposures to respirable crystalline silica. Although any case of silicosis indicates a breakdown in prevention, a case of acute or accelerated silicosis implies current high exposure and a very marked breakdown in prevention.

In addition to silicosis, employees exposed to respirable crystalline silica, especially those with accelerated or acute silicosis, are at increased risks of contracting active TB and other infections (ATS 1997; Rees and Murray 2007). Exposure to respirable crystalline silica also increases an employee's risk of developing lung cancer, and the higher the cumulative exposure, the higher the risk (Steenland et al. 2001; Steenland and Ward 2014). Symptoms for these diseases and other respirable crystalline silica-related diseases are discussed below.

1.2. Chronic Silicosis. Chronic silicosis is the most common presentation of silicosis and usually occurs after at least 10 years of exposure to respirable crystalline silica. The clinical presentation of chronic silicosis is:

1.2.1. Symptoms - shortness of breath and cough, although employees may not notice any symptoms early in the disease. Constitutional symptoms, such as fever, loss of appetite and fatigue, may indicate other diseases associated with silica exposure, such as TB infection or lung cancer. Employees with these symptoms should immediately receive further evaluation and treatment.

1.2.2. Physical Examination - may be normal or disclose dry rales or rhonchi on lung auscultation.

1.2.3. Spirometry - may be normal or may show only a mild restrictive or obstructive pattern.

1.2.4. Chest X-ray - classic findings are small, rounded opacities in the upper lung fields bilaterally. However, small irregular opacities and opacities in other lung areas can also occur. Rarely, "eggshell calcifications" in the hilar and mediastinal lymph nodes are seen.

1.2.5. Clinical Course - chronic silicosis in most cases is a slowly progressive disease. Under the respirable crystalline silica standard, the PLHCP is to recommend that employees with a 1/0 category X-ray be referred to an American Board Certified Specialist in Pulmonary Disease or Occupational Medicine. The PLHCP and/or Specialist should counsel employees regarding work practices and personal habits that could affect employees' respiratory health.

1.3. Accelerated Silicosis. Accelerated silicosis generally occurs within 5-10 years of exposure and results from high levels of exposure to respirable crystalline silica. The clinical presentation of accelerated silicosis is:

1.3.1. Symptoms - shortness of breath, cough, and sometimes sputum production. Employees with exposure to respirable crystalline silica, and especially those with accelerated silicosis, are at high risk for activation of TB infections, atypical mycobacterial infections, and fungal superinfections. Constitutional symptoms, such as fever, weight loss, hemoptysis (coughing up blood), and fatigue may herald one of these infections or the onset of lung cancer.

1.3.2. Physical Examination - rales, rhonchi, or other abnormal lung findings in relation to illnesses present. Clubbing of the digits, signs of heart failure, and cor pulmonale may be present in severe lung disease.

1.3.3. Spirometry - restrictive or mixed restrictive/obstructive pattern.

1.3.4. Chest X-ray - small rounded and/or irregular opacities bilaterally. Large opacities and lung abscesses may indicate infections, lung cancer, or progression to complicated silicosis, also termed progressive massive fibrosis.

1.3.5. Clinical Course - accelerated silicosis has a rapid, severe course. Under the respirable crystalline silica standard, the PLHCP can recommend referral to a Board Certified Specialist in either Pulmonary Disease or Occupational Medicine, as deemed appropriate, and referral to a Specialist is recommended whenever the diagnosis of accelerated silicosis is being considered.

1.4. Acute Silicosis. Acute silicosis is a rare disease caused by inhalation of extremely high levels of respirable crystalline silica particles. The pathology is similar to alveolar proteinosis with lipoproteinaceous material accumulating in the alveoli. Acute silicosis develops rapidly, often, within a few months to less than 2 years of exposure, and is almost always fatal. The clinical presentation of acute silicosis is as follows:

1.4.1. Symptoms - sudden, progressive, and severe shortness of breath. Constitutional symptoms are frequently present and include fever, weight loss, fatigue, productive cough, hemoptysis (coughing up blood), and pleuritic chest pain.

1.4.2. Physical Examination - dyspnea at rest, cyanosis, decreased breath sounds, inspiratory rales, clubbing of the digits, and fever.

1.4.3. Spirometry - restrictive or mixed restrictive/obstructive pattern.

1.4.4. Chest X-ray - diffuse haziness of the lungs bilaterally early in the disease. As the disease progresses, the "ground glass" appearance of interstitial fibrosis will appear.

1.4.5. Clinical Course - employees with acute silicosis are at especially high risk of TB activation, nontuberculous mycobacterial infections, and fungal superinfections. Acute silicosis is immediately life-threatening. The employee should be urgently referred to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine for evaluation and treatment. Although any case of silicosis indicates a breakdown in prevention, a case of acute or accelerated silicosis implies a profoundly high level of silica exposure and may mean that other employees are currently exposed to dangerous levels of silica.

1.5. *COPD.* COPD, including chronic bronchitis and emphysema, has been documented in silica-exposed employees, including those who do not develop silicosis. Periodic spirometry tests are performed to evaluate each employee for progressive changes consistent with the development of COPD. In addition to evaluating spirometry results of individual employees over time, PLHCPs may want to be aware of general trends in spirometry results for groups of employees from the same workplace to identify possible problems that might exist at that workplace. (See Section 2 of this Appendix on Medical Surveillance for further discussion.) Heart disease may develop secondary to lung diseases such as COPD. A recent study by Liu et al. 2014 noted a significant exposure-response trend between cumulative silica exposure and heart disease deaths, primarily due to pulmonary heart disease, such as cor pulmonale.

1.6. Renal and Immune System. Silica exposure has been associated with several types of kidney disease, including glomerulonephritis, nephrotic syndrome, and end stage renal disease requiring dialysis. Silica exposure has also been associated with other autoimmune conditions, including progressive systemic sclerosis, systemic

lupus erythematosus, and rheumatoid arthritis. Studies note an association between employees with silicosis and serologic markers for autoimmune diseases, including antinuclear antibodies, rheumatoid factor, and immune complexes (Jalloul and Banks 2007; Shtraichman et al. 2015).

1.7. TB and Other Infections. Silica-exposed employees with latent TB are 3 to 30 times more likely to develop active pulmonary TB infection (ATS 1997; Rees and Murray 2007). Although respirable crystalline silica exposure does not cause TB infection, individuals with latent TB infection are at increased risk for activation of disease if they have higher levels of respirable crystalline silica exposure, greater profusion of radiographic abnormalities, or a diagnosis of silicosis. Demographic characteristics, such as immigration from some countries, are associated with increased rates of latent TB infection. PLHCPs can review the latest Centers for Disease Control and Prevention (CDC) information on TB incidence rates and high risk populations online (See Section 5 of this Appendix). Additionally, silica-exposed employees are at increased risk for contracting nontuberculous mycobacterial infections, including Mycobacterium avium-intracellulare and Mycobacterium kansaii.

1.8. Lung Cancer. The National Toxicology Program has listed respirable crystalline silica as a known human carcinogen since 2000 (NTP 2014). The International Agency for Research on Cancer (2012) has also classified silica as Group 1 (carcinogenic to humans). Several studies have indicated that the risk of lung cancer from exposure to respirable crystalline silica and smoking is greater than additive (Brown 2009; Liu et al. 2013). Employees should be counseled on smoking cessation.

2. Medical Surveillance.

PLHCPs who manage silica medical surveillance programs should have a thorough understanding of the many silica-related diseases and health effects outlined in Section 1 of this Appendix. At each clinical encounter, the PLHCP should consider silica-related health outcomes, with particular vigilance for acute and accelerated silicosis. In this Section, the required components of medical surveillance under the respirable crystalline silica standard are reviewed, along with additional guidance and recommendations for PLHCPs performing medical surveillance examinations for silica-exposed employees.

2.1. History.

2.1.1. The respirable crystalline silica standard requires the following: A medical and work history, with emphasis on: past, present, and anticipated exposure to respirable crystalline silica, dust, and other agents affecting the respiratory system; any history of respiratory system dysfunction, including signs and symptoms of respiratory disease (*e.g.*, shortness of breath, cough, wheezing); history of TB; and smoking status and history.

2.1.2. Further, the employer must provide the PLHCP with the following information:

2.1.2.1. A description of the employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to respirable crystalline silica;

2.1.2.2. The employee's former, current, and anticipated levels of occupational exposure to respirable crystalline silica;

2.1.2.3. A description of any personal protective equipment used or to be used by the employee, including when and for how long the employee has used or will use that equipment; and

2.1.2.4. Information from records of employment-related medical examinations previously provided to the employee and currently within the control of the employer.

2.1.3. Additional guidance and recommendations: A history is particularly important both in the initial evaluation and in periodic examinations. Information on past and current medical conditions (particularly a history of kidney disease, cardiac disease, connective tissue disease, and other immune diseases), medications, hospitalizations and surgeries may uncover health risks, such as immune suppression, that could put an employee at increased health risk from exposure to silica. This information is important when counseling the employee on risks and safe work practices related to silica exposure.

2.2. Physical Examination.

2.2.1. The respirable crystalline silica standard requires the following: A physical examination, with special emphasis on the respiratory system. The physical examination must be performed at the initial examination and every three years thereafter.

2.2.2. Additional guidance and recommendations: Elements of the physical examination that can assist the PHLCP include: an examination of the cardiac system, an extremity examination (for clubbing, cyanosis, edema, or joint abnormalities), and an examination of other pertinent organ systems identified during the history.

2.3. TB Testing.

2.3.1. The respirable crystalline silica standard requires the following: Baseline testing for TB on initial examination.

2.3.2. Additional guidance and recommendations:

2.3.2.1. Current CDC guidelines (See Section 5 of this Appendix) should be followed for the application and interpretation of Tuberculin skin tests (TST). The interpretation and documentation of TST reactions should be performed within 48 to 72 hours of administration by trained PLHCPs.

2.3.2.2. PLHCPs may use alternative TB tests, such as interferon-release assays (IGRAs), if sensitivity and specificity are comparable to TST (Mazurek et al. 2010; Slater et al. 2013). PLHCPs can consult the current CDC guidelines for acceptable tests for latent TB infection.

2.3.2.3. The silica standard allows the PLHCP to order additional tests or test at a greater frequency than required by the standard, if deemed appropriate. Therefore, PLHCPs might perform periodic (*e.g.*, annual) TB testing as appropriate, based on employees' risk factors. For example, according to the American Thoracic Society (ATS), the diagnosis of silicosis or exposure to silica for 25 years or more are indications for annual TB testing (ATS 1997). PLHCPs should consult the current CDC guidance on risk factors for TB (See Section 5 of this Appendix).

2.3.2.4. Employees with positive TB tests and those with indeterminate test results should be referred to the appropriate agency or specialist, depending on the test results and clinical picture. Agencies, such as local public health departments, or specialists, such as a pulmonary or infectious disease specialist, may be the appropriate referral. Active TB is a nationally notifiable disease. PLHCPs should be aware of the reporting requirements for their region. All States have TB Control Offices that can be contacted for further information. (See Section 5 of this Appendix for links to CDC's TB resources and State TB Control Offices.)

2.3.2.5. The following public health principles are key to TB control in the U.S. (ATS-CDC-IDSA 2005):

(1) Prompt detection and reporting of persons who have contracted active TB;

(2) Prevention of TB spread to close contacts of active TB cases;

(3) Prevention of active TB in people with latent TB through targeted testing and treatment; and

(4) Identification of settings at high risk for TB transmission so that appropriate infection-control measures can be implemented.

2.4. Pulmonary Function Testing.

2.4.1. The respirable crystalline silica standard requires the following: Pulmonary function testing must be performed on the initial examination and every three years thereafter. The required pulmonary function test is spirometry and must include forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and FEV1/FVC ratio. Testing must be administered by a spirometry technician with a current certificate from a National Institute for Occupational Health and Safety (NIOSH)-approved spirometry course.

2.4.2. Additional guidance and recommendations: Spirometry provides information about individual respiratory status and can be used to track an employee's respiratory status over time or as a surveillance tool to follow individual and group respiratory function. For quality results, the ATS and the American College of Occupational and Environmental Medicine (ACOEM) recommend use of the third National Health and Nutrition Examination Survey (NHANES III) values, and ATS publishes recommendations for spirometry equipment (Miller et al. 2005; Townsend 2011; Redlich et al. 2014). OSHA's publication, Spirometry Testing in Occupational Health Programs: Best Practices for Healthcare Professionals, provides helpful guidance (See Section 5 of this Appendix). Abnormal spirometry results may warrant further clinical evaluation and possible recommendations for limitations on the employee's exposure to respirable crystalline silica.

2.5. Chest X-ray.

2.5.1. The respirable crystalline silica standard requires the following: A single posteroanterior (PA) radiographic projection or radiograph of the chest at full inspiration recorded on either film (no less than 14 x 17 inches and no more than 16 x 17 inches) or digital radiography systems. A chest X-ray must be performed on the initial examination and every three years thereafter. The chest X-ray must be interpreted and classified according to the International Labour Office (ILO) International Classification of Radiographs of Pneumoconioses by a NIOSH-certified B Reader.

Chest radiography is necessary to diagnose silicosis, monitor the progression of silicosis, and identify associated conditions such as TB. If the B reading indicates small opacities in a profusion of 1/0 or higher, the employee is to receive a recommendation for referral to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine.

2.5.2. Additional guidance and recommendations: Medical imaging has largely transitioned from conventional film-based radiography to digital radiography systems. The ILO Guidelines for the Classification of Pneumoconioses has historically provided film-based chest radiography as a referent standard for comparison to individual exams. However, in 2011, the ILO revised the guidelines to include a digital set of referent standards that were derived from the prior film-based standards. To assist in assuring that digitally-acquired radiographs are at least as safe and effective as film radiographs, NIOSH has prepared guidelines, based upon accepted contemporary professional recommendations (See Section 5 of this Appendix). Current research from Laney et al. 2011 and Halldin et al. 2014 validate the use of the ILO digital referent images. Both studies conclude that the results of pneumoconiosis classification using digital references are

comparable to film-based ILO classifications. Current ILO guidance on radiography for pneumoconioses and B-reading should be reviewed by the PLHCP periodically, as needed, on the ILO or NIOSH websites (See Section 5 of this Appendix).

2.6. Other Testing. Under the respirable crystalline silica standards, the PLHCP has the option of ordering additional testing he or she deems appropriate. Additional tests can be ordered on a case-by-case basis depending on individual signs or symptoms and clinical judgment. For example, if an employee reports a history of abnormal kidney function tests, the PLHCP may want to order a baseline renal function tests (*e.g.*, serum creatinine and urinalysis). As indicated above, the PLHCP may order annual TB testing for silica-exposed employees who are at high risk of developing active TB infections. Additional tests that PLHCPs may order based on findings of medical examinations include, but is not limited to, chest computerized tomography (CT) scan for lung cancer or COPD, testing for immunologic diseases, and cardiac testing for pulmonary-related heart disease, such as cor pulmonale.

3. Roles and Responsibilities.

3.1. PLHCP. The PLHCP designation refers to "an individual whose legally permitted scope of practice (*i.e.*, license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the particular health care services required" by the respirable crystalline silica standard. The legally permitted scope of practice for the PLHCP is determined by each State. PLHCPs who perform clinical services for a silica medical surveillance program should have a thorough knowledge of respirable crystalline silica-related diseases and symptoms. Suspected cases of silicosis, advanced COPD, or other respiratory conditions causing impairment should be promptly referred to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine.

Once the medical surveillance examination is completed, the employer must ensure that the PLHCP explains to the employee the results of the medical examination and provides the employee with a written medical report within 30 days of the examination. The written medical report must contain a statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to respirable crystalline silica and any medical conditions that require further evaluation or treatment. In addition, the PLHCP's written medical report must include any recommended limitations on the employee's use of respirators, any recommended limitations on the employee's exposure to respirable crystalline silica, and a statement that the employee should be examined by a Board Certified Specialist in Pulmonary Disease or Occupational medicine if the chest X-ray is classified as 1/0 or higher by the B Reader, or if referral to a Specialist is otherwise deemed appropriate by the PLHCP.

The PLHCP should discuss all findings and test results and any recommendations regarding the employee's health, worksite safety and health practices, and medical referrals for further evaluation, if indicated. In addition, it is suggested that the PLHCP offer to provide the employee with a complete copy of their examination and test results, as some employees may want this information for their own records or to provide to their personal physician or a future PLHCP. Employees are entitled to access their medical records.

Under the respirable crystalline silica standard, the employer must ensure that the PLHCP provides the employer with a written medical opinion within 30 days of the employee examination, and that the employee also gets a copy of the written medical opinion for the employer within 30 days. The PLHCP may choose to directly provide the employee a copy of the written medical opinion. This can be particularly

helpful to employees, such as construction employees, who may change employers frequently. The written medical opinion can be used by the employee as proof of up-to-date medical surveillance. The following lists the elements of the written medical report for the employee and written medical opinion for the employer. (Sample forms for the written medical report for the employee, the written medical opinion for the employer, and the written authorization are provided in Section 7 of this Appendix.)

3.1.1. The written medical report for the employee must include the following information:

3.1.1.1. A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to respirable crystalline silica and any medical conditions that require further evaluation or treatment;

3.1.1.2. Any recommended limitations upon the employee's use of a respirator;

3.1.1.3. Any recommended limitations on the employee's exposure to respirable crystalline silica; and

3.1.1.4. A statement that the employee should be examined by a Board Certified Specialist in Pulmonary Disease or Occupational Medicine, where the standard requires or where the PLHCP has determined such a referral is necessary. The standard requires referral to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine for a chest X-ray B reading indicating small opacities in a profusion of 1/0 or higher, or if the PHLCP determines that referral to a Specialist is necessary for other silica-related findings.

3.1.2. The PLHCP's written medical opinion for the employer must include only the following information:

3.1.2.1. The date of the examination;

3.1.2.2. A statement that the examination has met the requirements of this section; and

3.1.2.3. Any recommended limitations on the employee's use of respirators.

3.1.2.4. If the employee provides the PLHCP with written authorization, the written opinion for the employer shall also contain either or both of the following:

(1) Any recommended limitations on the employee's exposure to respirable crystalline silica; and

(2) A statement that the employee should be examined by a Board Certified Specialist in Pulmonary Disease or Occupational Medicine if the chest X-ray provided in accordance with this section is classified as 1/0 or higher by the B Reader, or if referral to a Specialist is otherwise deemed appropriate.

3.1.2.5. In addition to the above referral for abnormal chest X-ray, the PLHCP may refer an employee to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine for other findings of concern during the medical surveillance examination if these findings are potentially related to silica exposure.

3.1.2.6. Although the respirable crystalline silica standard requires the employer to ensure that the PLHCP explains the results of the medical examination to the employee, the standard does not mandate how this should be done. The written medical opinion for the employer could contain a statement that the PLHCP has explained the results of the medical examination to the employee.

3.2. Medical Specialists. The silica standard requires that all employees with chest X-ray B readings of 1/0 or higher be referred to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine. If the employee has given written authorization for the employer to be informed, then the employer shall make available a medical examination by a Specialist within 30 days after receiving the PLHCP's written medical opinion.

3.2.1. The employer must provide the following information to the Board Certified Specialist in Pulmonary Disease or Occupational Medicine:

3.2.1.1. A description of the employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to respirable crystalline silica;

3.2.1.2. The employee's former, current, and anticipated levels of occupational exposure to respirable crystalline silica;

3.2.1.3. A description of any personal protective equipment used or to be used by the employee, including when and for how long the employee has used or will use that equipment; and

3.2.1.4. Information from records of employment-related medical examinations previously provided to the employee and currently within the control of the employer.

3.2.2. The PLHCP should make certain that, with written authorization from the employee, the Board Certified Specialist in Pulmonary Disease or Occupational Medicine has any other pertinent medical and occupational information necessary for the specialist's evaluation of the employee's condition.

3.2.3. Once the Board Certified Specialist in Pulmonary Disease or Occupational Medicine has evaluated the employee, the employer must ensure that the Specialist explains to the employee the results of the medical examination and provides the employee with a written medical report within 30 days of the examination. The employer must also ensure that the Specialist provides the employer with a written medical opinion within 30 days of the employee examination. (Sample forms for the written medical report for the employee, the written medical opinion for the employer and the written authorization are provided in Section 7 of this Appendix.)

3.2.4. The Specialist's written medical report for the employee must include the following information:

3.2.4.1. A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to respirable crystalline silica and any medical conditions that require further evaluation or treatment;

3.2.4.2. Any recommended limitations upon the employee's use of a respirator; and

3.2.4.3. Any recommended limitations on the employee's exposure to respirable crystalline silica.

3.2.5. The Specialist's written medical opinion for the employer must include the following information:

3.2.5.1. The date of the examination; and

3.2.5.2. Any recommended limitations on the employee's use of respirators.

3.2.5.3. If the employee provides the Board Certified Specialist in Pulmonary Disease or Occupational Medicine with written authorization, the written medical opinion for the employer shall also contain any recommended limitations on the employee's exposure to respirable crystalline silica.

3.2.5.4. Although the respirable crystalline silica standard requires the employer to ensure that the Board Certified Specialist in Pulmonary Disease or Occupational Medicine explains the results of the medical examination to the employee, the standard does not mandate how this should be done. The written medical opinion for the employer could contain a statement that the Specialist has explained the results of the medical examination to the employee.

3.2.6. After evaluating the employee, the Board Certified Specialist in Pulmonary Disease or Occupational Medicine should provide feedback to the PLHCP as appropriate, depending on the reason for the referral. OSHA believes that because the PLHCP has the primary relationship with the employer and employee, the Specialist may want to communicate his or her findings to the PLHCP and have the PLHCP simply update the original medical report for the employee and medical opinion for the employer. This is permitted under the standard, so long as all requirements and time deadlines are met.

3.3. Public Health Professionals. PLHCPs might refer employees or consult with public health professionals as a result of silica medical surveillance. For instance, if individual cases of active TB are identified, public health professionals from state or local health departments may assist in diagnosis and treatment of individual cases and may evaluate other potentially affected persons, including coworkers. Because silica-exposed employees are at increased risk of progression from latent to active TB, treatment of latent infection is recommended. The diagnosis of active TB, acute or accelerated silicosis, or other silica-related diseases and infections should serve as sentinel events suggesting high levels of exposure to silica and may require consultation with the appropriate public health agencies to investigate potentially similarly exposed coworkers to assess for disease clusters. These agencies include local or state health departments or OSHA. In addition, NIOSH can provide assistance upon request through their Health Hazard Evaluation program. (See Section 5 of this Appendix)

4. Confidentiality and Other Considerations.

The information that is provided from the PLHCP to the employee and employer under the medical surveillance section of OSHA's respirable crystalline silica standard differs from that of medical surveillance requirements in previous OSHA standards. The standard requires two separate written communications, a written medical report for the employee and a written medical opinion for the employer. The confidentiality requirements for the written medical opinion are more stringent than in past standards. For example, the information the PLHCP can (and must) include in his or her written medical opinion for the employer is limited to: the date of the examination, a statement that the examination has met the requirements of this section, and any recommended limitations on the employee's use of respirators. If the employee provides written authorization for the disclosure of any limitations on the employee's exposure to respirable crystalline silica, then the PLHCP can (and must) include that information in the written medical opinion for the employer as well. Likewise, with the employee's written authorization, the PLHCP can (and must) disclose the PLHCP's referral recommendation (if any) as part of the written medical opinion for the employer. However, the opinion to the employer must not include information regarding recommended limitations on the employee's exposure to respirable crystalline silica or any referral recommendations without the employee's written authorization.

The standard also places limitations on the information that the Board Certified Specialist in Pulmonary Disease or Occupational Medicine can provide to the employer without the employee's written authorization. The Specialist's written medical opinion for the employer, like the PLHCP's opinion, is limited to (and must contain): the date of the examination and any recommended limitations on the employee's use of respirators. If the employee provides written authorization, the written medical opinion can (and must) also contain any limitations on the employee's exposure to respirable crystalline silica.

The PLHCP should discuss the implication of signing or not signing the authorization with the employee (in a manner and language that he or she understands) so that the employee can make an informed decision regarding the written authorization and its consequences. The discussion should include the risk of ongoing silica exposure, personal risk factors, risk of disease progression, and possible health and economic consequences. For instance, written authorization is required for a PLHCP to advise an employer that an employee should be referred to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine for evaluation of an abnormal chest X-ray (B-reading 1/0 or greater). If an employee does not sign an authorization, then the employer will not know and cannot facilitate the referral to a Specialist and is not required to pay for the Specialist's examination. In the rare case where an employee is diagnosed with acute or accelerated silicosis, co-workers are likely to be at significant risk of developing those diseases as a result of inadequate controls in the workplace. In this case, the PLHCP and/or Specialist should explain this concern to the affected employee and make a determined effort to obtain written authorization from the employee so that the PLHCP and/or Specialist can contact the employer.

Finally, without written authorization from the employee, the PLHCP and/or Board Certified Specialist in Pulmonary Disease or Occupational Medicine cannot provide feedback to an employer regarding control of workplace silica exposure, at least in relation to an individual employee. However, the regulation does not prohibit a PLHCP and/or Specialist from providing an employer with general recommendations regarding exposure controls and prevention programs in relation to silica exposure and silica-related illnesses, based on the information that the PLHCP receives from the employer such as employees' duties and exposure levels. Recommendations may include increased frequency of medical surveillance examinations, additional medical surveillance components, engineering and work practice controls, exposure monitoring and personal protective equipment. For instance, more frequent medical surveillance examinations may be a recommendation to employers for employees who do abrasive blasting with silica because of the high exposures associated with that operation.

ACOEM's Code of Ethics and discussion is a good resource to guide PLHCPs regarding the issues discussed in this section (See Section 5 of this Appendix).

5. Resources.

5.1. American College of Occupational and Environmental Medicine (ACOEM):

ACOEM Code of Ethics. Accessed at: http://www.acoem.org/codeofconduct.aspx

Raymond, L.W. and Wintermeyer, S. (2006) ACOEM evidenced-based statement on medical surveillance of silica-exposed workers: medical surveillance of workers exposed to crystalline silica. J Occup Environ Med, 48, 95-101.

5.2. Center for Disease Control and Prevention (CDC)

Tuberculosis webpage: http://www.cdc.gov/tb/default.htm

State TB Control Offices web page: http://www.cdc.gov/tb/links/tboffices.htm

Tuberculosis Laws and Policies webpage: http://www.cdc.gov/tb/programs/laws/default.htm

CDC. (2013). Latent Tuberculosis Infection: A Guide for Primary Health Care Providers. Accessed at: http://www.cdc.gov/tb/publications/ltbi/pdf/targetedltbi.pdf

5.3. International Labour Organization

International Labour Office (ILO). (2011) Guidelines for the use of the ILO International Classification of Radiographs of Pneumoconioses, Revised edition 2011. Occupational Safety and Health Series No. 22: http://www.ilo.org/safework/info/publications/WCMS_168260/lang--en/index.htm

5.4. National Institute of Occupational Safety and Health (NIOSH)

NIOSH B Reader Program webpage. (Information on interpretation of X-rays for silicosis and a list of certified B-readers). Accessed at: http://www.cdc.gov/niosh/topics/chestradiography/breader-info.html

NIOSH Guideline (2011). Application of Digital Radiography for the Detection and Classification of Pneumoconiosis. NIOSH publication number 2011-198. Accessed at: http://www.cdc.gov/niosh/docs/2011-198/

NIOSH Hazard Review (2002), Health Effects of Occupational Exposure to Respirable Crystalline Silica. NIOSH publication number 2002-129: Accessed at http://www.cdc.gov/niosh/docs/2002-129/

NIOSH Health Hazard Evaluations Programs. (Information on the NIOSH Health Hazard Evaluation (HHE) program, how to request an HHE and how to look up an HHE report). Accessed at: http://www.cdc.gov/niosh/hhe/

5.5. National Industrial Sand Association:

Occupational Health Program for Exposure to Crystalline Silica in the Industrial Sand Industry. National Industrial Sand Association, 2nd ed. 2010. Can be ordered at: http://www.sand.org/silica-occupational-health-program

5.6. Occupational Safety and Health Administration (OSHA)

Contacting OSHA: http://www.osha.gov/html/Feed_Back.html

OSHA's Clinicians webpage. (OSHA resources, regulations and links to help clinicians navigate OSHA's web site and aid clinicians in caring for workers.) Accessed at: http://www.osha.gov/dts/oom/clinicians/index.html

OSHA's Safety and Health Topics webpage on Silica. Accessed at: http://www.osha.gov/dsg/topics/silicacrystalline/index.html

OSHA (2013). Spirometry Testing in Occupational Health Programs: Best Practices for Healthcare Professionals. (OSHA 3637-03 2013). Accessed at: http://www.osha.gov/Publications/OSHA3637.pdf

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OSHA/NIOSH (2011) Spirometry: OSHA/NIOSH Spirometry Worker Info. (OSHA 3418-3-11). Accessed at http://www.osha.gov/Publications/osha3418.pdf

5.7. Other

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6. References.

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Occupational Safety and Health Administration/National Institute for Occupational Safety and Health (OSHA/NIOSH) (2015). Hazard alert. Worker exposure to silica during countertop manufacturing, finishing, and installation. (OSHA- HA-3768-2015).

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7. Sample Forms.

Three sample forms are provided. The first is a sample written medical report for the employee. The second is a sample written medical opinion for the employer. And the third is a sample written authorization form that employees sign to clarify what information the employee is authorizing to be released to the employer.

WRITTEN MEDICAL REPORT FOR EMPLOYEE

EMPLOYEE NAME: _____ **DATE OF EXAMINATION**: _____

TYPE OF EXAMINATION:
[ ] Initial examination [ ] Periodic examination [ ] Specialist examination
[ ] Other: _____

RESULTS OF MEDICAL EXAMINATION:

Physical Examination –	[ ] Normal	[ ] Abnormal (see below)	[ ] Not performed
Chest X-Ray –	[ ] Normal	[ ] Abnormal (see below)	[ ] Not performed
Breathing Test (Spirometry) –	[ ] Normal	[ ] Abnormal (see below)	[ ] Not performed
Test for Tuberculosis –	[ ] Normal	[ ] Abnormal (see below)	[ ] Not performed
Other:_____	[ ] Normal	[ ] Abnormal (see below)	[ ] Not performed

Results reported as abnormal: _____
_____

[ ] Your health may be at increased risk from exposure to respirable crystalline silica due to the following:
_____

RECOMMENDATIONS:
[ ] No limitations on respirator use
[ ] Recommended limitations on use of respirator: _____
[ ] Recommended limitations on exposure to respirable crystalline silica: _____
_____

Dates for recommended limitations, if applicable: _____ (MM/DD/YYYY) to _____ (MM/DD/YYYY)

[ ] I recommend that you be examined by a Board Certified Specialist in Pulmonary Disease or Occupational Medicine

[ ] Other recommendations*:
_____
_____

Your next periodic examination for silica exposure should be in: [ ] 3 years [ ] Other: _____ (MM/DD/YYYY)

Examining Provider: _____ (signature) Date: _____

Provider Name: _____

Office Address: _____ Office Phone: _____

*These findings may not be related to respirable crystalline silica exposure or may not be work-related, and therefore may not be covered by the employer. These findings may necessitate follow-up and treatment by your personal physician.

Respirable Crystalline Silica standard (§ 1910.1053 or 1926.1153)

WRITTEN MEDICAL OPINION FOR EMPLOYER

EMPLOYER: _____

EMPLOYEE NAME: _____ **DATE OF EXAMINATION:** _____

TYPE OF EXAMINATION:
[ ] Initial examination [ ] Periodic examination [ ] Specialist examination
[ ] Other: _____

USE OF RESPIRATOR:
[ ] No limitations on respirator use
[ ] Recommended limitations on use of respirator:_____

Dates for recommended limitations, if applicable: _____ to _____
MM/DD/YYYY MM/DD/YYYY

The employee has provided written authorization for disclosure of the following to the employer (if applicable):

[ ] This employee should be examined by an American Board Certified Specialist in Pulmonary Disease or Occupational Medicine
[ ] Recommended limitations on exposure to respirable crystalline silica:_____
_____

Dates for exposure limitations noted above: _____ to _____
MM/DD/YYYY MM/DD/YYYY

NEXT PERIODIC EVALUATION: [ ] 3 years [ ] Other: _____
MM/DD/YYYY

Examining Provider: _____ Date: _____
(signature)
Provider Name: _____ Provider's specialty:_____

Office Address: _____ Office Phone: _____

[ ] I attest that the results have been explained to the employee.

The following is required to be checked by the Physician or other Licensed Health Care Professional (PLHCP):
[ ] I attest that this medical examination has met the requirements of the medical surveillance section of the OSHA Respirable Crystalline Silica standard (§ 1910.1053(h) or 1926.1153(h)).

AUTHORIZATION FOR CRYSTALLINE SILICA OPINION TO EMPLOYER

This medical examination for exposure to crystalline silica could reveal a medical condition that results in recommendations for (1) limitations on respirator use, (2) limitations on exposure to crystalline silica, or (3) examination by a specialist in pulmonary disease or occupational medicine. Recommended limitations on respirator use will be included in the written opinion to the employer. If you want your employer to know about limitations on crystalline silica exposure or recommendations for a specialist examination, you will need to give authorization for the written opinion to the employer to include one or both of those recommendations.

I hereby authorize the opinion to the employer to contain the following information, if relevant (please check all that apply):

☐ Recommendations for limitations on crystalline silica exposure

☐ Recommendation for a specialist examination

OR

☐ I do not authorize the opinion to the employer to contain anything other than recommended limitations on respirator use.

Please read and initial:

___ I understand that if I do not authorize my employer to receive the recommendation for specialist examination, the employer will not be responsible for arranging and covering costs of a specialist examination.

_____
Name (printed)

_____ _____
Signature Date

WORKERS' RIGHTS

Under federal law, workers are entitled to working conditions that do not pose a risk of serious harm.

For more information on how to assure a safe and healthful workplace, see OSHA's Workers page.

OSHA ASSISTANCE, SERVICES AND PROGRAMS

OSHA has a great deal of information to assist employers in complying with their responsibilities under OSHA law. Several OSHA programs and services can help employers identify and correct job hazards, as well as improve their safety and health program.

Establishing a Safety and Health Program

Safety and health programs are systems that can substantially reduce the number and severity of workplace injuries and illnesses, while reducing costs to employers.

Visit www.osha.gov/shpguidelines for more information.

Compliance Assistance Specialists

OSHA Compliance assistance specialists can provide information to employers and workers about OSHA standards, short educational programs on specific hazards or OSHA rights and responsibilities, and information on additional compliance assistance resources.

Visit www.osha.gov/dcsp/compliance_assistance/cas.html or call 1-800-321-OSHA (6742) to contact your local OSHA office.

Free On-site Safety and Health Consultation Services for Small Business

OSHA's On-site Consultation Program offers free and confidential advice to small and medium-sized businesses in all states, with priority given to high-hazard worksites.

On-site consultation services are separate from enforcement and do not result in penalties or citations.

For more information or to find the local On-site Consultation office in your state, visit www.osha.gov/consultation, or call 1-800-321-OSHA (6742).

Under the consultation program, certain exemplary employers may request participation in OSHA's **Safety and Health Achievement Recognition Program (SHARP)**. Worksites that receive SHARP recognition are exempt from programmed inspections during the period that the SHARP certification is valid.

Cooperative Programs

OSHA offers cooperative programs under which businesses, labor groups and other organizations can work cooperatively with OSHA. To find out more about any of the following programs, visit www.osha.gov/cooperativeprograms.

Strategic Partnerships and Alliances

The OSHA Strategic Partnerships (OSP) provide the opportunity for OSHA to partner with employers, workers, professional or trade associations, labor organizations, and/or other interested stakeholders. Through the Alliance Program, OSHA works with groups to develop compliance assistance tools and resources to share with workers and employers, and educate workers and employers about their rights and responsibilities.

Voluntary Protection Programs (VPP)

The VPP recognize employers and workers in private industry and federal agencies who have implemented effective safety and health management programs and maintain injury and illness rates below the national average for their respective industries.

Occupational Safety and Health Training Courses

The OSHA Training Institute partners with 27 OSHA Training Institute Education Centers at 42 locations throughout the United States to deliver courses on OSHA standards and occupational safety and health topics to thousands of students a year. For more information on training courses, visit www.osha.gov/otiec.

OSHA Educational Materials

OSHA has many types of educational materials to assist employers and workers in finding and preventing workplace hazards.

All OSHA publications are free at www.osha.gov/publications and www.osha.gov/ebooks. You can also call 1-800-321-OSHA (6742) to order publications.

Employers and safety and health professionals can sign-up for *QuickTakes*, OSHA's free, twice-monthly online newsletter with the latest news about OSHA initiatives and products to assist in finding and preventing workplace hazards. To sign up visit www.osha.gov/quicktakes.

OSHA REGIONAL OFFICES

Region I
Boston Regional Office
(CT*, ME*, MA, NH, RI, VT*)
JFK Federal Building, Room E340
Boston, MA 02203
(617) 565-9860 (617) 565-9827 Fax

Region II
New York Regional Office
(NJ*, NY*, PR*, VI*)
201 Varick Street, Room 670
New York, NY 10014
(212) 337-2378 (212) 337-2371 Fax

Region III
Philadelphia Regional Office
(DE, DC, MD*, PA, VA*, WV)
The Curtis Center
170 S. Independence Mall West
Suite 740 West
Philadelphia, PA 19106-3309
(215) 861-4900 (215) 861-4904 Fax

Region IV
Atlanta Regional Office
(AL, FL, GA, KY*, MS, NC*, SC*, TN*)
61 Forsyth Street, SW, Room 6T50
Atlanta, GA 30303
(678) 237-0400 (678) 237-0447 Fax

Region V
Chicago Regional Office
(IL*, IN*, MI*, MN*, OH, WI)
230 South Dearborn Street
Room 3244
Chicago, IL 60604
(312) 353-2220 (312) 353-7774 Fax

Region VI
Dallas Regional Office
(AR, LA, NM*, OK, TX)
525 Griffin Street, Room 602
Dallas, TX 75202
(972) 850-4145 (972) 850-4149 Fax
(972) 850-4150 FSO Fax

Region VII
Kansas City Regional Office
(IA*, KS, MO, NE)
Two Pershing Square Building
2300 Main Street, Suite 1010
Kansas City, MO 64108-2416
(816) 283-8745 (816) 283-0547 Fax

Region VIII
Denver Regional Office
(CO, MT, ND, SD, UT*, WY*)
Cesar Chavez Memorial Building
1244 Speer Boulevard, Suite 551
Denver, CO 80204
(720) 264-6550 (720) 264-6585 Fax

Region IX
San Francisco Regional Office
(AZ*, CA*, HI*, NV*, and American Samoa,
Guam and the Northern Mariana Islands)
90 7th Street, Suite 18100
San Francisco, CA 94103
(415) 625-2547 (415) 625-2534 Fax

Region X
Seattle Regional Office
(AK*, ID, OR*, WA*)
300 Fifth Avenue, Suite 1280
Seattle, WA 98104
(206) 757-6700 (206) 757-6705 Fax

*These states and territories operate their own OSHA-approved job safety and health plans and cover state and local government employees as well as private sector employees. The Connecticut, Illinois, Maine, New Jersey, New York and Virgin Islands programs cover public employees only. (Private sector workers in these states are covered by Federal OSHA). States with approved programs must have standards that are identical to, or at least as effective as, the Federal OSHA standards.

Note: To get contact information for OSHA area offices, OSHA-approved state plans and OSHA consultation projects, please visit us online at www.osha.gov or call us at 1-800-321-OSHA (6742).

HOW TO CONTACT OSHA

For questions or to get information or advice, to report an emergency, fatality, inpatient hospitalization, amputation, or loss of an eye, or to file a confidential complaint, contact your nearest OSHA office, visit www.osha.gov or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

For assistance, contact us.
We are OSHA. We can help.

OSHA®
www.osha.gov

U.S. Department of Labor

For more information:

OSHA® Occupational Safety and Health Administration

www.osha.gov (800) 321-OSHA (6742)