Crystalline Silica Dust
Requirements for Construction Workers

**WHY**

Per OSHA 29 CFR 1926.1153, the United States Department of Labor requires that employers implement control measures for each employee exposed to 50 micrograms/m3 over an 8-hour day of respirable crystalline silica dust (silica dust).

Crystalline silica dust is hazardous when very small (respirable) particles, are inhaled. Exposure to respirable, crystalline silica can occur in a broad range of industries. In construction work, sources of silica include sand, stone, rock, concrete, brick, block, and mortar. When these materials are disturbed by activities such as drilling/coring, cutting, sawing, grinding, chipping, jack hammering, abrading, and crushing, the resultant worker inhalation exposure can be well above occupational, permissible exposure limits.

To control exposure to crystalline silica, OSHA’s revised silica in construction standard promotes the use of wet methods and exhaust ventilation, to minimize airborne contamination from respirable, crystalline silica, and discourages reliance solely on respiratory protection. Regarding respirators, we must apply the hierarchy of controls—engineering controls first. Respirators are not to be relied upon unless engineering controls cannot limit exposure below the PEL.

**HOW**

**OSHA has provided 3 options for compliance:**

1. Use Table 1, which predefines applications and approved solutions.

2. Provide objective data proving the control method you are using keeps the silica dust exposure within permissible exposure limit of 50 micrograms/m3 per 8-hour day (PEL).

3. Schedule self-monitoring programs to ensure employees are not exposed to applications exceeding the PEL.

**OSHA Requirements:**

* Select one of the three compliance options above. Your company’s policy must be WRITTEN and must contain your company’s Exposure Control Plan (see samples below).
* Designate a key competent person to implement the exposure control plan, identify exposure risks, take actions to correct issues.
* Communicate with, and train workers to work safely, when exposed to silica dust.
* Restrict housekeeping practices (dry sweeping and using compressed air) when silica dust is present.
* Maintain records of your control plan and actions
* You must offer medical exams during first 30 days to workers required to wear a respirator 30 or more times a year. The medical exam must include chest x-rays and lung function tests and must be offered every 3 years.
* Keep records of the above.
* ALWAYS refer to OSHA’s “Small Entity Compliance Guide for Respirable Crystalline Silica Standard for Construction” for the exact word of the rule and for more information.

**Sample Policy for Respirable Crystalline Silica Dust**

The policy of \_\_\_\_\_\_\_\_\_\_ (company name) is to perform all work activities in a manner conforming to all of the OSHA requirements. Employees working with silica dust must be identified and provided with training prior to assignment to any duties that may bring them into contact with silica dust. This company will provide the safest possible working conditions for its employees and other individuals at our work locations who may be exposed to conditions that we create. The requirements, therefore, are conditions of employment and are subject to any, and/or all of the disciplinary procedures outlined in the disciplinary section of this manual.

**Objectives**

To safeguard our employees’ health by:

* Providing a management guide for compliance
* Complying with Department of Labor and Industry OSHA 29 CFR 1926.1153

**Scope**

This program will provide the means by which the information regarding the hazards of working with silica dust is communicated to employees. It will include, but will not be limited to the following requirements:

* Identify silica-generating tasks performed on company property that expose a worker to silica dust (refer to Table 1)
* Evaluation of the potential hazards and to determine the engineering controls/ work practices that will be implemented to minimize worker exposure to respirable crystalline silica
* Train employees to use this information to avoid, and/or lessen potential hazards.
* Administration will be the responsibility of the Safety Coordinator who will insure that all of the above stated requirements are met to insure compliance with the law.

**Compliance**

Our company complies with the Silica Rule in the following manner: **(Select one.)**

* Use Table 1, which predefines applications and approved solutions. See Appendix Table 1.
* Provide objective data proving the control method you are using keeps the silica dust exposure within permissible exposure limit of 50 micrograms/m3 per 8-hour day (PEL). See Appendix A—Methods of Sample Analysis.
* If the company identifies any task that will exposure a worker to silica dust that does not fall within Table 1, the company will schedule self-monitoring programs to ensure employees are not exposed to applications exceeding the PEL. See Appendix B—Medical Surveillance Guidelines.

Our company has completed the following steps REQUIRED to comply with the Silica Rule: **(each step is required by the rule)**

* Designate a key competent person(s) to implement the exposure control plan, identify exposure risks, take actions to correct issues. The \_\_\_\_\_\_\_\_\_\_\_\_\_ (safety coordinator) of this company has the authority and responsibility to be sure that our company and our employees are in compliance OSHA’s Crystalline Silica Rule for Construction. *(Note: your company may need to designate more than one key competent person, depending on your needs.)*
* Communicate the hazards of working with silica dust and train workers to work safely when exposed to silica dust. Any time work process and/or the products/tools our company uses change, employees will be given training relevant to the new process, and/or use of the new tool.
* Restrict housekeeping practices (dry sweeping and using compressed air) when silica dust is present
* Maintain records of our control plans and actions
* Offer medical exams to workers required to wear a respirator 30 or more times a year.

**Implementation**

The following steps will be taken to ensure compliance:

* Assess what tasks will expose a worker to respirable silica dust
* Determine if the task falls within Table 1
	+ Develop procedures to keep the list current.
	+ Add new tools/tasks, when they are used, to the list.
	+ Remove tools/tasks from the list when their use is discontinued.
* If a Table 1 task, acquire the needed tools/equipment/ PPE
* If not a Table 1 task, schedule exposure assessments to determine worker exposure
	+ The level of exposure will determine what next steps need to be taken (i.e., nothing, because exposures are <PEL; implement use of engineering controls because of exposures are >PEL; on-going periodic monitoring until exposures are <PEL; respiratory protection use until controls can be implements that reduce exposure below the PEL; etc.)
* Schedule required training for those affected workers
	+ Establish who will be the competent person(s)

**Employee Training**

The \_\_\_\_\_\_\_\_\_\_\_\_\_ (safety coordinator) will identify employees working and/or routinely exposed to silica dust. The \_\_\_\_\_\_\_\_\_\_\_\_\_ (safety coordinator) will review our employee training program and advise on initial training, or annual retraining needs.

The following training will be done:

* Retraining will be done annually.
* Training will be done when there is a hazardous change in product and/or work procedure,
* Regular safety meetings will review the information presented in the initial training using audio, visual, and classroom training specially prepared for this purpose.

The following topics will be discussed during training:

* Existence and requirements of OSHA standards
* A review/explanation of the silica dust health hazards and where the risks are located
* Safety precautions and protective procedures that will be implemented specific for the task(s) performed
* Identify the key competent person(s) assigned by the employer
* Employee rights, in a union shop, to notify your employer, your union official or OSHA about job hazards; to file a grievance regarding health or safety; to be on a company or union safety committee, and to participate in OSHA hearings, meetings, conferences and such
* Purpose and description of the medical surveillance program
* Notify the employee that they have a right to a medical exam if they are required to wear a respirator 30 or more times a year

As part of the assessment of the training program, the \_\_\_\_\_\_\_\_\_\_\_\_\_ (safety coordinator) will obtain input from employees regarding the training they have received and their suggestions for improving it.

Notes: For more information, see OSHA's Silica Dust Rule 29 CFR 1926.1153, contact a competent safety professional or the OSHA Consulting office.

OSHA’s Small Entity Compliance Guide for Respirable Crystalline Silica Standard for Construction: <https://www.osha.gov/Publications/OSHA3902.pdf>

*These rules are samples only. Each employer is responsible for working with his/her employees to write rules that meet the specific needs of their individual company and type of work. Each employer is responsible for assessing the accuracy of their rules and keeping them up to date. OSHA requires a minimum of an update and employee re-training annually.*

**Crystalline Silica Dust—Employee Training**

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| --- | --- | --- |
| **Task** (refer to Table 1) | **Employees Working and/or Routinely Exposed to Silica Dust:** | **Date Trained** |
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(optional training log)

***WRITTEN Exposure Control Plan***

*Your company’s Exposure Control Plan must be written. There are 18 tasks on OSHA’s Table 1. You should have an Exposure Control Plan for EACH task that is performed by employees in your company. Below are samples of an Exposure Control Plans for Task “i” and for Task “x.”*

**(SAMPLE) Exposure Control Plan**

**Company:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Person Completing the Plan, Title:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Description of Task:**

(Table 1 - Task “i”) Using stationary masonry saws on concrete and tile floors inside homes or public buildings.

**Control Description**

**Controls:**

* Use saw equipped with integrated water delivery system that continuously feeds water to the blade.

**Work practices:**

* Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions.
* Ensure an adequate supply of water for dust suppression is used
* The spray nozzle is not clogged or damaged;
* All hoses and connections are intact.

**Respiratory protection:**

* None required regardless of task duration

**Housekeeping:**

* Dust containing silica on work surfaces and equipment must be cleaned up using wet methods or a HEPA-filtered vacuum, includes wet sweeping compounds that minimize airborne dust.
* Do not use compressed air or dry sweeping for removing dust and debris containing silica from work surfaces.
* Dispose of used vacuum bags in a container and keep the container sealed.

**Procedures Used to Restrict Access to Work Areas:**

Schedule the work so that only employees who are engaged in the task of using the stationary masonry saws are in the area.

**(SAMPLE) Exposure Control Plan**

**Company:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Person Completing the Plan, Title:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Description of Task:**

(Table 1 - Task “x”) Demolishing concrete and tile floors inside homes or public buildings using a jackhammer.

**Control Description**

**Controls:**

• Use jackhammer equipped with the appropriate, commercially available shroud and a vacuum dust collection system with the flow rate recommended by the jackhammer manufacturer, a filter that is at least 99 percent efficient, and a filter cleaning mechanism.

* Use a portable fan to exhaust air and prevent the buildup of dust.

**Work practices:**

* Check shrouds and hoses to make sure they are not damaged before starting work.
* Make sure the hoses do not become kinked or bent while working.
* Use switch on vacuum to activate filter cleaning at the frequency recommended by the manufacturer.
* Replace vacuum bags as needed to prevent overfilling.
* Use the jackhammer and vacuum controls according to manufacturer’s instructions for reducing the release of visible dust.
* If visible dust increases, check controls and adjust as needed.

**Respiratory protection:**

* Use respirator with APF of 10 the entire time the task is being performed.
* See the written respiratory protection program for information on selection, training and fit testing requirements, in addition to proper use instructions for respirators (for example, being clean shaven when using a respirator that seals against the face).

**Housekeeping:**

* Dust containing silica on work surfaces and equipment must be cleaned up using wet methods or a HEPA-filtered vacuum.
* Do not use compressed air or dry sweeping for removing dust and debris containing silica from work surfaces.
* Dispose of used vacuum bags in a container and keep the container sealed.

**Procedures Used to Restrict Access to Work Areas:**

Schedule the work so that only employees who are engaged in the task (the jackhammer operator and employees helping the operator) are in the area.

Source: OSHA.GOV.

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Appendix Table 1

|  |  |  |
| --- | --- | --- |
| **Equipment/Task** | **Engineering and Work Practice Control Methods** | **Required respiratory protection and minimum assigned protection factor (APF)** |
| **≤ 4 hours/shift** | **>4 hours/shift** |
| (i) Stationary masonry saws | Use saw equipped with integrated water delivery system that continuously feeds water to the bladeOperate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions | None | None |
| (ii) Handheld power saws (any blade diameter) | Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions: |  |  |
| -When used outdoors | None | APF 10 |
| -When used indoors or in an enclosed area | None | APF 10 |
| (iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less) | For tasks performed outdoors only:Use saw equipped with commercially available dust collection systemOperate and maintain tool in accordance with manufacturer's instructions to minimize dust emissionsDust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency | None | None |
| (iv) Walk-behind saws | Use saw equipped with integrated water delivery system that continuously feeds water to the bladeOperate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions: |  |  |
| -When used outdoors | None | APF 10 |
| -When used indoors or in an enclosed area | None | APF 10 |
| (v) Drivable saws | For tasks performed outdoors only: Use saw equipped with integrated water delivery system that continuously feeds water to the bladeOperate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions | None | None |
| (vi) Rig-mounted core saws or drills | Use tool equipped with integrated water delivery system that supplies water to cutting surfaceOperate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions | None | None |
| (vii) Handheld and stand-mounted drills (including impact and rotary hammer drills) | Use drill equipped with commercially available shroud or cowling with dust collection systemOperate and maintain tool in accordance with manufacturer's instructions to minimize dust emissionsDust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanismUse a HEPA-filtered vacuum when cleaning holes | None | None |
| (viii) Dowel drilling rigs for concrete | For tasks performed outdoors only: Use shroud around drill bit with a dust collection system. Dust collector must have a filter with 99% or greater efficiency and a filtercleaning mechanismUse a HEPA-filtered vacuum when cleaning holes | APF 10 | APF 10 |
| (ix) Vehicle-mounted drilling rigs for rock and concrete | Use dust collection system with close capture hood or shroud around drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector OR  | None | None |
| Operate from within an enclosed cab and use water for dust suppression on drill bit | None | None |
| (x) Jackhammers and handheld powered chipping tools | Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact: |  |  |
| -When used outdoors | None | APF 10 |
| -When used indoors or in an enclosed area  | APF 10 | APF 10 |
| OR |  |  |
| Use tool equipped with commercially available shroud and dust collection system |  |  |
| Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions |  |  |
| Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism: |  |  |
| -When used outdoors | None | APF 10 |
| -When used indoors or in an enclosed area | APF 10 | APF 10 |
| (xi) Handheld grinders for mortar removal (i.e., tuckpointing) | Use grinder equipped with commercially available shroud and dust collection system | APF 10 | APF 25 |
| Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions |  |  |
| Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism |  |  |
| (xii) Handheld grinders for uses other than mortar removal | For tasks performed outdoors only:Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface | None | None |
| Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions OR  |  |  |
| Use grinder equipped with commercially available shroud and dust collection system |  |  |
| Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emission |  |  |
| Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism: |  |  |
| -When used outdoors | None | None |
| -When used indoors or in an enclosed area | None | APF 10 |
| (xiii) Walk-behind milling machines and floor grinders | Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface |  |  |
| Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions OR  |  |  |
| Use machine equipped with dust collection system recommended by the manufacturer | None | None |
| Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions |  |  |
| Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism |  |  |
| When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes |  |  |
| (xiv) Small drivable milling machines (less than half-lane) | Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant | None | None |
| Operate and maintain machine to minimize dust emissions |  |  |
| (xv) Large drivable milling machines (half-lane and larger) | For cuts of any depth on asphalt only:Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust | None | None |
| Operate and maintain machine to minimize dust emissions |  |  |
| For cuts of four inches in depth or less on any substrate: |  |  |
| Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust | None | None |
| Operate and maintain machine to minimize dust emissions |  |  |
| OR |  |  |
| Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant | None | None |
| Operate and maintain machine to minimize dust emissions |  |  |
| (xvi) Crushing machines | Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points) | None | None |
| Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions |  |  |
| Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station |  |  |
| (xvii) Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials | Operate equipment from within an enclosed cab | None | None |
| When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions | None | None |
| (xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: Demolishing, abrading, or fracturing silica-containing materials | Apply water and/or dust suppressants as necessary to minimize dust emissions | None | None |
| OR |  |  |
| When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab | None | None |

Source: https://www.osha.gov/Publications/OSHA3902.pdf

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Appendix A – Methods of Sample Analysis

**Appendix A to § 1926.1153 – 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.

Source: https://www.osha.gov/Publications/OSHA3902.pdf

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Appendix B—Medical Surveillance Guidelines

**Appendix B to** § **1926.1153 – 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-γ 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: [www.acoem.org/codeofconduct.aspx](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: 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.) http://www.osha.gov/dts/oom/clinicians/index.html

OSHA’s Safety and Health Topics webpage on Silica. 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

OSHA/NIOSH (2011). Spirometry: OSHA/NIOSH Spirometry InfoSheet (OSHA 3415-1-11). (Provides guidance to employers). Accessed at http://www.osha.gov/Publications/osha3415.pdf

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

Steenland, K. and Ward E. (2014). Silica: A lung carcinogen. CA Cancer J Clin, 64, 63-69. (This article reviews not only silica and lung cancer but also all the known silica-related health effects. Further, the authors provide guidance to clinicians on medical surveillance of silica-exposed workers and worker counselling on safety practices to minimize silica exposure.)

**6. References. \*\***

\*\* References can be found at the source of this document: *www.osha.gov/Publications/OSHA3902.pdf*

**APPENDIX B Continued**

**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: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_

MM/DD/YYYY 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: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 (signature)

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.

Source: OSHA.GOV. Respirable Crystalline Silica standard (§ 1910.1053 or 1926.1153)

**APPENDIX B Continued**

**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

Source: OSHA.GOV. Respirable Crystalline Silica standard (§ 1910.1053(h) or 1926.1153(h)).

**APPENDIX B Continued**

**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

Source: OSHA.GOV.