

# CRYSTALLINE SILICA EMPLOYEE TRAINING

## **PROGRAM SYNOPSIS:**

Crystalline silica is a naturally occurring substance used in a wide variety of industries and construction operations such as the production of cement, sandblasting operations, the production of glass and ceramics and as a filter for water and sewage treatment. It is also a common additive in food and pharmaceutical applications and is used in the production of fiber optic cables. While silica has many valuable uses, it can also present a danger when workers are exposed to excessive amounts of crystalline silica dust. In fact, each year there are hundreds of deaths and thousands of illnesses attributed to harmful exposures to silica dust. To prevent these types of harmful exposures, OSHA has developed regulations for general industry, maritime operations and the construction industry. This program discusses some key requirements from these regulations as well as some safe work practices that employees can follow to protect themselves from harmful exposure to crystalline silica.

Topics include characteristics and properties of silica, effects of exposure, engineering controls, work practice controls, respiratory protection and Table 1 of the construction regulation.

## **PROGRAM OUTLINE:**

### **CHARACTERISTICS & PROPERTIES**

- Crystalline silica is also known as Silicon Dioxide or SiO<sub>2</sub>. Silica is a component of granite, sand, cement, rock and many other materials. Silica is a naturally-occurring chemical compound found in the earth's crust.
- The most common form of silica is quartz. Two other forms of silica are cristobalite and tridymite.
- These various forms of silica can become dangerous when extremely small particles, often called "silica dust", are inhaled into the lungs. OSHA refers to this type of inhalable silica dust as "respirable crystalline silica."
- Anytime you hear the term respirable crystalline silica, it is referring to silica dust that can be inhaled into your lungs.
- Some operations that generate respirable crystalline silica include cutting, drilling, or grinding any type of material that contains silica.
- Also, employees working in manufacturing processes that utilize silica, such as glass manufacturing or foundries may also be exposed to respirable crystalline silica.
- This type of potentially harmful silica dust can be so small that it cannot be seen with the naked eye. This is why it is so important to always take proper precautions in order to avoid harmful levels of exposure.

### **EFFECTS OF EXPOSURE**

- Crystalline silica is classified as a carcinogen of the lungs. A carcinogen is a substance that has the potential to cause cancer.
- As workers inhale tiny silica particles over time, they are at increased risk of developing serious, and often deadly, silica-related illnesses.
- In addition to lung cancer, another disease associated with the inhalation of silica dust is silicosis. Chronic silicosis, also known as classic silicosis, is a fibrotic lung disease that typically occurs after many years of low to moderate exposures to silica dust.
- Silicosis causes scar tissue to form in the lungs and as the disease progresses, the victim may experience shortness of breath during exercise and have clinical signs of poor oxygen/carbon dioxide exchange.
- In severe cases, silicosis can be disabling or even fatal due to respiratory failure. There is no known cure for silicosis.
- A less common form of silicosis is acute silicosis. This form of silicosis occurs after exposures to very high concentrations of silica. Symptoms include severe, disabling shortness of breath, weakness and weight loss. Acute silicosis often leads to death.

- Breathing in silica dust has also been linked to the acceleration or severity of such diseases as tuberculosis, emphysema, kidney diseases, chronic bronchitis and chronic obstructive pulmonary disease, or COPD.

## **REGULATIONS**

- In order to protect workers from contracting diseases due to respirable silica exposures, the Occupational Safety and Health Administration has issued Respirable Crystalline Silica Standards for general industry, maritime operation and the construction industry.
- When air monitoring determines that airborne levels of crystalline silica have reached the “action level” of 25 micrograms per cubic meter of air averaged over an eight-hour period, the employer must implement certain requirements of these OSHA regulations.
- One such requirement is to have a written exposure control plan for silica that outlines the tasks in the workplace that involve exposure, the engineering controls, work practices and respiratory protection used to limit exposure for each task and the housekeeping measures to be used to limit exposure to silica dust.
- OSHA’s construction standard specifically requires a competent person be assigned to implement the exposure control plan.
- Regulations also require that any worker exposed to the action level of 25 micrograms per cubic meter of air for 30 or more days per year must be offered a medical exam every three years. These medical exams must include a chest X- ray and a lung-function test.
- In addition, construction workers who are required to wear a respirator as protection from silica dust for 30 or more days per year must also be offered a medical exam every three years. The medical exams must be offered to employees at no cost.
- OSHA has set the permissible exposure limit, often called the PEL, of crystalline silica to be 50 micrograms of respirable crystalline silica per cubic meter of air averaged over an eight-hour work day.
- OSHA regulations require organizations to use engineering and work practice controls as the primary means to limit worker exposure to respirable crystalline silica to below the permissible exposure limit of 50 micrograms per cubic meter of air.
- When engineering and work practice controls cannot adequately limit exposure, then the OSHA regulations require that employers provide appropriate respiratory protection to reduce exposure to permissible levels.
- The OSHA standards also require that regulated areas be established to limit employee access to areas where exposures exceed the permissible exposure limit. The posting of warning signs at the entrances to regulated areas is required.
- To ensure that employees are aware of air sampling and exposure monitoring results, notifications should be provided to employees in writing or by posting the results in an area that is accessible to all employees.

## **ENGINEERING CONTROLS**

- By far the best way to reduce exposure to silica dust is to eliminate the dust completely or reduce its presence in the work area by the use of engineering and work practice controls.
- There are four general types of engineering controls used to prevent exposure to silica dust: substitution, isolation, ventilation and dust suppression.
- Substitution is simply replacing silica with another material that is less hazardous such as crushed glass, nickel slag or aluminum oxide.

- Isolation is the placement of barriers around a work area where silica is used. These barriers should restrict silica dust from spreading throughout the workplace.
- Ventilation is supplying clean air to a worker performing a task that involves silica dust or exhausting air containing dust before it can be inhaled.
- Dust suppression is when a water-based system is used to prevent silica dust from becoming airborne. For example, wet-cutting masonry products is much preferred to dry cutting.

### **WORK PRACTICE CONTROLS**

- In addition to these types of engineering controls, work practice controls can also be used to limit exposure. Work practice controls refer to actions that employees can take while working to reduce exposure to silica dust.
- For example, good housekeeping practices are essential in reducing the risk of exposure. Build ups of dust should be removed with a water hose or by wet sweeping to prevent creating airborne dust.
- Another option is to use a vacuum with a high-efficiency particulate filter, known as a HEPA filter, to clean up silica-related areas.
- You should strive to avoid using compressed air or dry sweeping these areas. These methods disperse dust particles into the air and dramatically increase the potential for exposure.
- Other work practice controls include the use of disposable work clothes when working around silica-containing materials and to shower and change into clean clothes before heading home.

### **RESPIRATORY PROTECTION**

- In many cases, engineering and work practice controls are infeasible or simply do not reduce respirable crystalline silica exposure to below the permissible exposure limit. When this is the case, employees must use respiratory protection to further limit their exposure.
- Anytime employees are required to use respirators, the employer must establish a written respiratory program that meets the requirements of OSHA’s Respiratory Protection Standard.
- For many job tasks, a simple N-95 NIOSH certified respirator will provide the necessary protection from silica dust. If other types of respirators are selected, be sure that the filter is certified for silica dust and that the respirator has an assigned protection factor of at least 10.
- Some job tasks, such as sandblasting operations, subject the worker to larger exposures and additional hazards. Sandblasting and similar operations require the use of a type CE positive pressure abrasive blasting respirator.
- If you have any questions about the proper respiratory protection required for any specific job task, be sure to ask your supervisor.

### **TABLE 1 OF THE CONSTRUCTION REGULATION**

- The construction industry presents many challenges when it comes to air monitoring employee exposure to silica dust. For this reason, the OSHA construction regulation includes a specific table titled “Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica.”
- Commonly called “Table 1”, this useful table matches common construction tasks with OSHA’s recommended silica dust control methods.
- Table 1 of the construction regulation contains three columns of information. The first column lists the equipment to be used or the task to be performed; the second column lists the appropriate engineering and work practice controls that should be in place; and, column three specifies if respiratory protection is required and if so, what type.

- When Table 1 is correctly followed, construction workers will not be exposed to harmful levels of silica dust. Because of this, employers who implement Table 1 are not required to measure workers' exposure to silica dust.

### **RESPONDING TO EXPOSURES**

- Most illnesses related to the inhalation of silica dust do not result from one sudden exposure; instead, they develop after months or years of exposures. This is why it is so important that you protect yourself in every exposure situation.
- If you begin to experience symptoms of a silica-related illness, such as shortness of breath, chest pains or fatigue, follow your organization's policy for reporting your condition so you can be evaluated by a healthcare professional.

## **PREPARE FOR THE SAFETY MEETING**

Review each section of this Leader's Guide as well as the program. Here are a few suggestions for using the program:

Make everyone aware of the importance the company places on health and safety and how each person must be an active member of the safety team.

Introduce the program. Play it without interruption. Review the program content by presenting the information in the program outline.

Copy the review questions included in this Leader's Guide and ask each participant to complete them.

Make an attendance record and have each participant sign the form. Maintain the attendance record and each participant's test paper as written documentation of the training performed.

Here are some suggestions for preparing your video equipment and the room or area you use:

Check the room or area for quietness, adequate ventilation and temperature, lighting and unobstructed access.

Check the seating arrangement and the audiovisual equipment to ensure that all participants will be able to see and hear the program.

## **CONDUCTING THE PRESENTATION**

Begin the meeting by welcoming the participants. Introduce yourself and give each person the opportunity to become acquainted if there are new people joining the training session.

Explain that the primary purpose of the program is to discuss some key requirements from OSHA's silica regulations as well as some safe work practices that employees can follow to protect themselves from harmful exposure to crystalline silica.

Introduce the program. Play it without interruption. Review the program content by presenting the information in the program outline.

Lead discussions about job tasks at your facility that have the potential to expose employees to silica dust and the specific precautions that should be taken to avoid these exposures.

After watching the program, the viewer should be able to explain the following:

- How exposure to crystalline silica affects the human body;
- What requirements must be implemented by organizations under the OSHA silica standards;
- What engineering controls and work practice controls are used to limit exposure;
- Which types of respiratory protection provide protection from silica dust;
- What information can be found in Table 1 of the construction standard.

**CRYSTALLINE SILICA EMPLOYEE TRAINING**  
**REVIEW QUIZ**

Name \_\_\_\_\_ Date \_\_\_\_\_

*Please provide answers to the following to show how well you understand the information presented during this program.*

1. Silica dust can be so small that it cannot be seen with the naked eye.
  - a. True
  - b. False
  
2. Which type of silicosis occurs after many years of low to moderate exposure to silica dust?
  - a. Acute silicosis
  - b. Complicated silicosis
  - c. Chronic silicosis
  
3. OSHA has set the permissible exposure limit, often called the "PEL", of crystalline silica to be \_\_\_\_\_ of respirable crystalline silica per cubic meter of air averaged over an eight-hour work day.
  - a. 25 micrograms
  - b. 50 micrograms
  - c. 100 micrograms
  
4. OSHA's \_\_\_\_\_ standard specifically requires a competent person be assigned to implement a written silica exposure control plan.
  - a. Construction
  - b. General industry
  - c. Maritime operation
  
5. \_\_\_\_\_ is the placement of barriers around a work area to restrict silica dust from spreading throughout a workplace.
  - a. Substitution
  - b. Isolation
  - c. Dust suppression
  
6. Work practice controls refer to actions taken by your employer to reduce exposure to silica dust.
  - a. True
  - b. False
  
7. You should avoid using compressed air to remove build ups of silica dust.
  - a. True
  - b. False
  
8. Your organization is only required to have a written respiratory program if it conducts sandblasting operations or other job tasks that require positive pressure respirators or other specialized equipment.
  - a. True
  - b. False
  
9. If you use a filter-type respirator as protection against silica dust, it should have an assigned protection factor of at least \_\_\_\_\_.
  - a. 10
  - b. 50
  - c. 100
  
10. Most illnesses related to the inhalation of silica dust do not result from one sudden exposure.
  - a. True
  - b. False

*ANSWERS TO THE REVIEW QUESTIONS*

1. a

2. c

3. b

4. a

5. b

6. b

7. a

8. b

9. a

10. a