Working Safely with Silica

WHAT EMPLOYERS AND EMPLOYEES CAN DO TO PREVENT SILICOSIS

INTRODUCTION

Are your employees working in a dusty environment? Do you know what’s in the air? Many workers are exposed to dust that contains silica. Breathing too much silica can cause silicosis.

What is Silicosis?

Silicosis is a disabling, irreversible and sometimes deadly lung disease caused by inhaling microscopic particles of crystalline silica. The disease is characterized by fibrosis or scarring of the lung tissue.

Silicosis typically occurs after years of exposure to silica but may occur more rapidly after very high exposures. There is no cure and silicosis can develop or progress even after the exposure to silica ends.

The Symptoms of Silicosis

In the early stages of silicosis, an individual may not experience any symptoms. As the disease progresses, symptoms may include:

- Shortness of breath
- Severe cough
- Weakness or fatigue
- Loss of appetite
- Fever

Persons with silicosis are also more susceptible to severe lung infections such as tuberculosis.

Who is at Risk of Exposure?

Two million workers in the United States are potentially exposed to silica. The industries at risk include:

- Mining
- Construction
- Manufacturing
- Agriculture

Common substances that may contain silica include:

- Rock
- Masonry
- Granite
- Sand
- Mortar
- Tiles
- Soil
- Plaster Abrasives
- Concrete
- Diatomaceous earth

A detailed list of industries and activities with potential exposure, along with materials containing silica, can be found in Appendix A of this document.

What is Silica?

Silica, or silicon dioxide, exists in several crystalline forms and in a non-crystalline (amorphous) form. Crystalline silica, in the form of quartz, is one of the most abundant minerals in the Earth’s crust and is a common component of rock, sand and soil. Other forms of crystalline silica include cristobalite and tridymite. Amorphous silica is less hazardous than the crystalline forms. Glass is an example of amorphous silica.

How Much Exposure is Too Much?

To protect worker health, California Occupational Safety and Health Association (Cal/OSHA), Federal Occupational Safety and

Health Association (Fed/OSHA), and Mine Safety and Health Administration (MSHA) have permissible exposure limits (PELs) that regulate how much crystalline silica a worker is permitted to breathe during the workday. Be sure you know which agency has jurisdiction over your operation. The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also has recommended exposure limits for crystalline silica. Although NIOSH and ACGIH exposure limits are non-regulatory, many safety and health professionals use these values as a guideline because they are often more protective and based on more recent scientific data.

The Employer's Role in Preventing Silicosis

- Because there is no cure for silicosis, prevention is essential. Below are steps that employers can take to prevent silicosis:
- Know and comply with all state and federal rules and guidelines regarding silica exposure
- Identify materials that may contain silica
- Identify activities that create dust
- Train employees
- Control exposures
- Ensure proper housekeeping
- Provide protective clothing and hygiene facilities
- Monitor the air employees breathe
- Conduct medical surveillance when appropriate
- Maintain records

Identify Materials That May Contain Silica

For some materials, the employer can look at a Safety Data Sheet (SDS) or contact the manufacturer to determine if a product contains silica. For other materials such as rock, soil and concrete there may not be an SDS. When that's the case assume that the material contains silica unless testing shows otherwise.

Identify Activities That Create Dust

Review your operation to determine where employee exposures to silica dust may be occurring. Be sure to include cleaning and maintenance activities. These tasks, even if they take less time or are done less frequently, often expose employees to large amounts of dust.

Provide Protective Clothing and Hygiene Facilities

Protective clothing and proper hygiene not only protects employees on the job, they also prevent workers from bringing home toxic materials. To protect workers and their families, employers should:

- Provide washing facilities at the worksite
- Ensure workers wash before eating, drinking, or smoking and before leaving the workplace
- Prohibit food, drink, and tobacco products in areas where silica dust is present
- Provide disposable or washable work clothes

Ensure that workers change into clean clothes before leaving the worksite.

Ensure Proper Housekeeping

Accumulations of silica dust need to be prevented through regular housekeeping. However, it is important that the dust not be reintroduced into the air and create additional exposures.

Proper housekeeping practices include the following:

- Use HEPA-filtered vacuum cleaners or water for cleaning up equipment or surfaces
- Prohibit the use of compressed air for cleaning equipment, surfaces, and clothing
- Prohibit dry sweeping and shoveling

Control Exposures

Exposures to silica dust can be eliminated or reduced using one or more of the following methods:

- Substitution

The best way to eliminate exposure to silica is to use an alternative, less toxic substance. A list of some substitutes for silica sand in abrasive blasting can be found in Appendix B.

- Engineering and Work Practice Controls

In many cases, it is impossible to eliminate or find a substitute for silica. The next best solution is the use of engineering and work practice controls. Examples of these control methods include:

- Enclose the process (e.g., abrasive blasting cabinets)
- Enclose the worker (e.g., enclosed cabs on construction and agricultural equipment)
- Use wet methods (e.g., concrete/masonry saws that provide water to the blade, flowing water through the drill stem during rock drilling, or water sprays to suppress dust)
- Use local exhaust ventilation (e.g., grinders and sanders with vacuum attachment systems)
- Institute procedures and work practices that minimize the amount of dust produced (e.g., materials handling techniques)

Respiratory Protection

Often, when there are overexposures, the first thing employers and employees do is reach for the respirator. But, occupational health and safety professionals (and Cal/OSHA) consider respirators a control method of last resort, rather than a preferred means of protecting employees. However, sometimes respiratory protection is appropriate, as in the following circumstances:

- During the time needed to implement engineering and work practice controls
- If engineering and work practice controls do not reduce

exposures sufficiently
- For operations where engineering and work practice controls are not feasible, such as some maintenance and repair activities

When respirators are used to prevent overexposures, a written Respiratory Protection Program is needed. The elements of this program include:

- Appropriate respirator selection
- Medical evaluation to determine the ability of a worker to use a respirator
- Annual face seal fit-testing
- Procedures for routine and emergency use
- Respirator inspection, cleaning, disinfecting, maintenance, storage, and repair
- Air quality for supplied-air devices
- Annual employee training
- Periodic program evaluation

For overexposures up to 10 times the PEL, a half-mask air–purifying respirator with N100 filters is the minimum level of protection recommended by OSHA. However, NIOSH has stated N95 filters are also acceptable at concentrations less than or equal to 0.5 mg/m3, which is 10 times the NIOSH REL for respirable crystalline silica. Some operations will need higher levels of protection. In abrasive blasting, for example, only type CE positive-pressure or pressure-demand abrasive-blasting respirators should be worn.

Train Employees

Provide training so that employees know the hazards of silica and how to protect themselves. Include the following in your training program:

- Health effects of silica
- Materials and products that contain silica
- Operations that may present a silica hazard
- Engineering controls and work practices that reduce exposure

- Proper housekeeping procedures
- Good personal hygiene practices
- Personal protective equipment to use

Monitor the Air Employees Breathe

How do you know if your workers are breathing too much silica dust? Air monitoring by a trained professional, such as an industrial hygienist, can determine the level of silica exposure in your workplace. By knowing if and where employees are overexposed, you can allocate your resources wisely and put control measures in place where they are needed.

Conduct Medical Surveillance When Appropriate

Medical surveillance can help detect disease early. So, it’s a good idea to provide baseline and periodic medical examinations for employees exposed to crystalline silica. Medical examinations should include:

- Medical and occupational history
- Chest X-rays
- Pulmonary function tests (spirometry)
- Annual evaluation for tuberculosis

NIOSH provides a list of doctors certified in interpreting X-rays for evidence of silicosis and other pneumoconiosis.

Maintain Records

Employers are required to keep a variety of records related to occupational safety and health. These include:

- Exposure records
- Medical surveillance records

Records of occupational injuries and illnesses (case of silicosis must be recorded on the Cal/OSHA Form 300)2

- Training Records

The Employee’s Role in Preventing Silicosis

Employers and employees working together can prevent silicosis. Below are steps that employees can take to prevent silicosis:

- Know which operations and tasks create silica
- Know what methods are being used to control silica dust and minimize exposures
- Follow work practices designed to minimize exposure to silica dust
- Report engineering control failures
- Wear a respirator when needed to prevent overexposure to silica dust
- Use HEPA-filtered vacuum cleaners or water for cleaning up equipment, surfaces, or clothing
- Do not dry sweep or shovel
- Change into disposable or washable work clothes at the worksite, when provided
- Change into clean clothing before leaving the worksite
- Wash hands and face before eating, drinking, or smoking
- Keep food, drink and tobacco products out of areas where silica dust is present
- Participate in any training, air monitoring and medical surveillance programs provided by the employer
- Do not use compressed air for cleaning equipment, surfaces and clothing