

## Silica Hazards

### Loss Bulletin

Silica dust encountered in the workplace has been a known hazard for centuries. There are two types of silica, amorphous and crystalline silica:

- Crystalline silica is hazardous and can cause serious respiratory disease. Crystalline silica is classified as a Group I carcinogen by the International Agency for Research on Cancer (IARC).
- Amorphous silica is naturally occurring or can be synthetically produced. The major problem with amorphous silica is when it is contaminated with crystalline silica. Intentionally manufactured amorphous silica is without contamination of crystalline silica.

### Health Hazards

Breathing dust that contains silica can result in irreversible damage to the lungs. Small particles, less than 1 micron (not visible to the naked eye) can accumulate in the lungs causing scarring tissue to build up resulting in irreversible lung damage known as silicosis. Silica is also suspected of having a causal relationship to chronic obstructive pulmonary disease (COPD), lung cancer, tuberculosis, emphysema, lupus, scleroderma, immunologic disorders, renal disease, stomach and other cancers, and rheumatoid arthritis.

Three forms of silicosis can develop depending on the duration and concentration of the exposure:

- Chronic silicosis from long term exposure of 10 years and longer to small concentrations of silica  
Accelerated silicosis from exposure to larger amounts of silica over a 4-to-10-year period
- Acute silicosis from short-term exposure to very large amounts of silica (a few weeks of exposure can cause injury)

### Operational Exposures

Silica is used in abrasive blasting/sand blasting, a process that may result in significant silica exposure.

Foundry employees may be exposed to crystalline silica throughout the metal casting process.

Crystalline silica is a major component of products including:

- Concrete and concrete blocks
- Bricks
- Ceramic and terracotta tile
- Roof tiles
- Manufactured stone
- Abrasive materials
- Grouts and mortars
- Some joint compounds
- Stucco
- Plastering material

## Silica Hazards

Agricultural employees involved in activities such as plowing, and harvesting may generate elevated levels of silica but OSHA does not regulate exposures on farms with less than 10 employees.

Amorphous silica in the form of cristobalite is used as filler in paint and as a filter media in the food and beverage industry. Where natural materials are handled, employers and workers in the following occupations can be exposed to silica dust at various levels:

- Construction: sandblasting, rock drilling, masonry work, jack hammering and tunneling
- Mining: cutting or drilling through sandstone and granite
- Foundry work: grinding, moldings, shakeout, core room
- Ceramics, clay, and pottery
- Stone cutting: sawing, abrasive blasting, chipping, and grinding
- Glass manufacturing
- Agriculture
- Railroads, setting and laying of track
- Manufacturing and use of abrasive products
- Manufacture of soaps and detergents
- Shipyards: abrasive blasting
- Rock crushing and transport: sand and gravel operations
- Demolition of concrete and masonry structures
- Dry sweeping or pressurized air blowing of concrete or sand dust
- Cement and asphalt pavement manufacturing: concrete mixing, tunneling, and cutting
- Paper and pulp mills: repair or replacement of linings of rotary kilns
- Food processing operations: preparing crops for market, sorting, grading, and washing

Silica may be encountered in numerous other operations. It's important to be aware of the risk of silicosis in industries not previously recognized to be at risk.

Crystalline silica can be found in certain types of natural material including:

- Sand
- Soil and rock
- Gravel
- Slate Granite Clay

### **Cal-OSHA Standard:**

Section 5155 regulates airborne contaminants in the form of dusts, fumes, mists, vapors, and gasses for general industry. Appendix Table AC-1 to section 5155 lists the permissible exposure limits for chemical contaminants, including silica.

The standard applies to all occupational exposures and forms of silica.

## Silica Hazards

Whenever it is reasonable to suspect that employees may be exposed to concentrations of airborne contaminants more than levels permitted in section 5155(c), the work environment should be monitored. In the case of silica, air monitoring should be conducted using prescribed methods that allow employee exposures to be measured or calculated.

The person supervising, directing, or evaluating the monitoring and control methods is to be versed in this standard and competent in industrial hygiene practice. Air samples should be collected and analyzed according to NIOSH Method Nos. 7500, 7601 and 7602 [NIOSH 1984] or their equivalent.

When exposures to airborne contaminants are found or are expected to exceed allowable levels, measures to control such harmful exposures must be instituted. Acceptable control measures in the order of regulatory preference are:

- engineering out the exposure
- use of administrative controls
- use of respiratory protection

### Exposure Limits

The Permissible Exposure Limits (PEL) for crystalline silica containing dust over an 8-hour period is:

- Cristobalite, respirable dust .05 mg/ m<sup>3</sup> Quartz, respirable dust 0.1 mg/ m<sup>3</sup> Quartz, total respirable dust 0.3 mg/ m<sup>3</sup> Silica, fused, respirable dust 0.1 mg/ m<sup>3</sup> Tridymite, respirable dust .05 mg/ m<sup>3</sup> Tripoli, respirable dust 0.1 mg/ m<sup>3</sup>
- The PEL for amorphous silica is: Diatomaceous Earth no PEL established Total Dust 6 mg/ m<sup>3</sup>
- Respirable fraction 3 mg/ m<sup>3</sup> (using a size selector with the characteristics in Cal-OSHA Section 5155, Table AC-1 (n) )
- Precipitated and gel 6 mg/ m<sup>3</sup>

### Methods of Compliance

- Where possible, work with products that don't contain silica. For example, there are a variety of materials such as glass beads, pumice, saw dust, steel grit, and walnut shells that are available as substitutes in sandblasting operations.
- If you can't substitute materials, minimize the dust in the breathing zone. Use equipment designed to cut, saw, and grind wet or use ventilation that captures the dust as it is created. Never use compressed air to clean dust-off equipment, surfaces or your clothes. Where safely feasible, use water or a HEPA vacuum. Consider using disposable or reusable clothes that stay at the worksite.
- Minimize dust generation when working with or around silica-containing materials.
- Handle and dispose of waste materials without generating airborne dust. Use a HEPA vacuum, squeegee instead of a broom, or sweeping compound, in that order.

## Silica Hazards

- If there are still excessive exposures to silica despite using controls, you may still need to use an appropriate respirator, along with a good respiratory protection program. Establish defined areas beyond which protection is required. (Reference T8CCR, Section 5144 for details on respirator requirements)

### Medical Evaluation Requirements

Medical evaluations should be available to all workers who may be exposed to crystalline silica. Such examinations should occur before job placement and at least every 3 years thereafter [NIOSH 1974b]. More frequent examinations may be necessary for workers at risk of acute or accelerated silicosis. Examinations should include at least the following items:

- A medical and occupational history to collect data on worker exposure to crystalline silica and signs and symptoms of respiratory disease
- A chest X-ray classified according to the 1980 International Labour Office (ILO) International Classification of Radiographs of Pneumoconiosis Pulmonary function testing (spirometry)
- An annual evaluation for tuberculosis [ATS/CDC 1986]

### Training

Employee training:

In addition to the requirements of the hazardous material communication standard, provide employees with training before their initial assignment and annually. Training should include:

- Information about the potential adverse health effects, including silicosis, lung cancer, chronic obstructive lung disease and loss of lung function
- Material safety data sheets for silica, alternative abrasives, or other hazardous materials
- Instruction about obeying signs that mark the boundaries of work areas containing silica
- Methods to be used to control airborne dust exposures, such as wet-cutting, local exhaust systems and isolation of the process
- Proper use and maintenance of dust control equipment, including safe handling, labeling and storage of collected waste
- Instruction about the use and care of appropriate protective equipment (including protective clothing and respiratory protection)
- Good personal hygiene and housekeeping including not smoking tobacco products, avoiding activities that can contribute to generation of airborne dust and cleaning up without generating airborne dust

## Silica Hazards

### Supervisors training will also include:

- Identification of tasks that may result in employee exposures
- Implementation procedures for the control methods employees are to use
- The information required for the employees

Periodic training is required at least annually.

### Recordkeeping

Air monitoring data - The employer must maintain an accurate record of all air monitoring conducted to comply with the requirements. The records must include at least the following information:

- The date of measurement for each sample taken
- The operation involving exposure to silica that is being monitored
- Sampling and analytical methods used and evidence of their accuracy
- Number, duration, and the results of samples taken
- Types of personal protective equipment, such as respirators worn
- Name, social security number and job classification of all employees represented by the monitoring, indicating which employees were actually monitored