

## Silica Control Program

---

Inhalation of crystalline silica containing dusts has been associated with silicosis, chronic obstructive pulmonary disease (COPD), bronchitis and lung cancer. Employees working in the construction industry, quarrying, mining, sandblasting, foundries and many other occupations are at risk for developing permanent pulmonary impairment due to exposure to crystalline silica.

### Background

Silica (silicon dioxide) is a basic component of sand, quartz and granite. Crystalline forms of silica include quartz and less common forms such as cristobalite and tridymite. These forms of silica are responsible for silicosis and other pulmonary diseases while noncrystalline forms of silica (amorphous) have not been associated with these diseases.

Quartz is the second most common mineral in the earth's crust. Cristobalite and tridymite occur naturally, but are commonly created by industrial processes where quartz is heated to high temperatures such as when diatomaceous earth is calcined or in refractive ceramic linings of furnaces. Crystalline silica is commonly referred to as silica sand, free silica, quartz, and cristobalite. Amorphous forms of silica include opal, flint, siliceous glass and vitreous silica.

### Sources of exposure

Crystalline silica is commonly found in industries including:

- Electronics
- Foundries
- Ceramics, clay and pottery
- Stone
- Glass
- Cement/Concrete
- Mining/Quarrying
- Abrasives
- Sandblasting
- Agriculture
- Construction

Crystalline silica is used as a molding agent in foundries; as a raw material in cement, brick, glass and tile manufacturing; and as a filler in soaps, paints, rubber, plastics and polishing compounds. One of the major uses of silica is as an abrasive blasting agent (sandblasting). Since concrete and masonry materials contain rocks and silica sand, construction workers are exposed to crystalline silica during:

- Sawing, drilling, grinding and chipping of concrete, masonry and rock materials
- Demolition of concrete and masonry structures

## **Silicosis**

Silicosis normally manifests itself more than 10 years after exposure to crystalline silica. Accelerated or acute forms of the disease may also occur a few months to 4-5 years after exposure to high levels of crystalline silica.

Workers with silicosis may have no initial symptoms. As the disease progresses, difficulty in breathing and cough may develop. Severe cases result in congestive heart failure. There is no treatment for the disease. Bacterial or fungal infections may also develop. A major cause of death associated with silicosis in the past was infection from *Mycobacterium tuberculosis* (TB). Lung x-rays reveal silica-containing nodules, which may progress to a more widespread fibrosis. Some individuals show x-ray evidence of the disease but no outward symptoms.

## **Silica control program**

A comprehensive silica control program should be initiated to effectively control silica exposures. The program should be an organized effort under the direction of a designated administrator. Written procedures should be developed addressing each of the following elements:

### **Exposure monitoring**

Employee monitoring should be performed as needed to measure worker exposure to airborne crystalline silica and as a basis for selecting engineering controls. Exposures should be kept below the ACGIH (American Conference of Governmental Industrial Hygienists) TLV (Threshold Limit Value).

### **Training**

- A comprehensive training program should be developed which contains the following:
- Information about the potential adverse health effects of silica
- How to read Material Safety Data Sheets
- Instructions about safe handling, labeling and storage of toxic materials
- Discussion about the importance of engineering controls, personal hygiene and work practices to reduce crystalline silica exposure
- Care and use of appropriate personal protective equipment

### **Respiratory protection program**

When engineering controls cannot keep exposures below the exposure limits, respiratory protection should be used. When respirators are used, a comprehensive Respiratory Protection Program should be established.

### **Personal hygiene**

Good personal hygiene is essential for protection against crystalline silica.

- Do not eat, drink or use tobacco products in dusty areas.
- Wash hands and face before eating, drinking and smoking.
- Change into work clothes at the work site. Shower and change into clean clothes before leaving the site.

### **Engineering controls**

- The most important measure to reduce crystalline silica exposure is to keep dust from becoming airborne.
- Use dust collection systems available on most types of dust generating equipment. Keep dust collection equipment well maintained.

- When sawing or cutting rock, concrete or masonry, use wet cutting methods.
- When drilling rock, pump water through the drill stem to reduce dust generation.
- Wet down roadways at quarries and construction sites.
- Isolate operators of drilling equipment, saws, loaders, trucks and other equipment in positive pressure, air-conditioned cabs.
- Use water or high-efficiency particulate (HEPA) vacuums for cleanup rather than air hoses. Use wet sweeping instead of dry sweeping.
- Use containment for sand blasting.

Replace silica sand with a less hazardous substitute. For example aluminum oxide, glass or plastic beads, steel shot, or walnut shells can be used instead of sand for blasting applications. Amorphous sand can be used for sand molding applications