

# Toolbox Talks

## Crystalline Silica

### Introduction

Crystalline silica is a basic component of soil, sand, granite, and many other minerals. Quartz is the most common form of crystalline silica. Cristobalite and tridymite are two other forms of crystalline silica.

Because crystalline silica is a natural component of sand, it is most commonly found in concrete, cement, and products made from these materials.

### Hazards of silica

Crystalline silica is different from other similar materials because it fragments into particles that are much smaller than other materials. This may occur when workers chip, saw, sand, grind or otherwise “decrepitate” (break up) materials that contain silica.

Most types of airborne dust particles are large enough that they will be stopped by the respiratory system’s self-defense mechanisms before entering the lungs, but this is not true of crystalline silica. These particles are small enough to evade the body’s defense mechanisms and infiltrate the lungs.

This leads to several risks:

- Silicosis. When these particles enter the lungs, the body’s natural reaction is to form scar tissue to immobilize the irritating particle. Formation of this scar tissue

interferes with the lungs’ ability to take up oxygen. This condition is known as silicosis, a disabling and fatal disease with no known cure.

- Crystalline silica has been classified as a human lung carcinogen.
- Because silicosis affects lung function, it makes one more susceptible to lung infections like tuberculosis.

### More about silicosis

Silicosis is classified into three types:

- **Chronic/classic silicosis**, the most common type of silicosis, occurs after 15–20 years of moderate to low exposures to respirable crystalline silica. Symptoms associated with chronic silicosis may or may not be obvious; therefore, workers need to have a chest x-ray to determine whether there is lung damage. As the disease progresses, the worker may experience shortness of breath upon exercising and have clinical signs of poor oxygen/carbon dioxide exchange. In the later stages, the worker may experience fatigue, extreme shortness of breath, chest pain, or respiratory failure.
- **Accelerated silicosis** can occur after 5–10 years of high exposures to respirable crystalline silica. Symptoms include severe shortness of breath, weakness, and weight

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loss. The onset of symptoms takes longer than in acute silicosis.

- **Acute silicosis** occurs after a few months or as long as 2 years following exposures to extremely high concentrations of respirable crystalline silica. Symptoms of acute silicosis include severe disabling shortness of breath, weakness, and weight loss, which often lead to death.

- Brick and concrete block cutting/sawing
- Tuck pointing
- Tunneling operations

## Where are workers exposed to crystalline silica?

In general, workers are exposed to crystalline silica whenever they create or come into contact with airborne dusts that contain silica. The seriousness of the exposure will depend on many factors, including:

- How much dust is present
- How much silica is present in the dust
- How long the exposure lasts
- How frequent the exposure is
- What type(s) of controls or personal protective equipment are used

Construction workers are an important area of concern. Exposure occurs during many different construction activities:

- The most severe exposures generally occur during abrasive blasting with sand to remove paint and rust from bridges, tanks, concrete structures, and other surfaces.
- Jack hammering
- Rock/well drilling
- Concrete mixing
- Concrete drilling



Non-construction employees may also have significant exposures resulting from abrasive blasting, sanding, grinding, sawing, crushing, hammering, or processing of materials like gravel, stone, concrete, etc.



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Other exposures to silica dust occur in cement and brick manufacturing, asphalt pavement manufacturing, china and ceramic manufacturing, and the tool and die, steel, and foundry industries.

Additionally, crystalline silica exposures occur in the maintenance, repair, and replacement of refractory brick furnace linings.

## **The effect of smoking on silica exposure**

Silica and cigarette smoke have synergistic effects on each other. This means that the effect of two chemicals together is far greater than the sum of the individual effects. The presence of one chemical enhances the effects of the second.

This means that employees who have silica exposure and smoke cigarettes have a far greater probability of developing serious health effects.

If you smoke, you should either quit smoking or be especially careful about your silica exposure.

## **Engineering controls to prevent exposure to silica**

Like any other hazard, the most desirable method to prevent silica exposure is to use engineering controls to actually remove the hazard from the workplace.

Ideally, silica should be eliminated from products and the workplace, whenever possible. Obviously, this may be possible in some cases, but usually it is not.

If a local exhaust ventilation system (LEV) is available, always be sure to use it. For example, whenever possible, abrasive blasting with sand should be performed in an enclosed blasting cabinet which provide ventilation and enclosure of the hazard. Always make sure any ventilation or enclosure equipment is in proper working conditions (i.e., air flow is adequate, there are no leaks in the system, etc.).

## **Administrative and work practice controls**

When engineering controls are not possible, administrative or work practice controls must be used to minimize the exposure. An administrative control is any measure that is taken to change the way a job is performed in order to control a hazard.

In the case of silica, the most important administrative control is usually to use “wet methods” to prevent dusts from becoming airborne.

Safe work practices include:

- Never clean the work area or equipment using a broom or compressed air. This will create airborne dust. Always vacuum the dust from your clothing, equipment, etc. using a HEPA vacuum.
- Participate in training, exposure monitoring, and health screening and surveillance programs so you remain aware of the hazards of silica, jobs or tasks that involve exposure risk, exposure prevention methods, etc.

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- Do not eat, drink, smoke, or apply cosmetics in areas where crystalline silica dust is present.
- Wash your hands and face outside of dusty areas before performing any of these activities.

## Questions

If you have questions on this topic, please contact the Office of Occupational Health and Safety at (612) 626-5008 or [uohs@umn.edu](mailto:uohs@umn.edu), or see the website at <http://www.ohs.umn.edu>.

## Personal Protective Equipment and Respiratory Protection

Depending on the work at hand, and your area's policies, you may be required or permitted to wear a particulate-filtering respirator like an N-95 filtering facepiece. But remember, in most cases, the use of any type of respiratory protection will require that you be included in a formal respiratory protection program with annual training, fit testing, medical evaluations, etc.



If you work with extremely high levels of silica, you should wear disposable clothing or change your clothes prior to leaving the worksite. This will prevent you from contaminating your home, and exposing your family to the toxic dust.