Controlling Silica in Construction

Silicosis is a disabling, nonreversible and sometimes fatal lung disease caused by overexposure to respirable crystalline silica. More than one million U.S. workers are exposed to crystalline silica, and each year more than 250 die from silicosis. There is no cure for the disease, but it is 100 percent preventable if employers and employees work together to reduce the exposures.

Silica is one of several chemicals included in the larger classification of silicon dioxide (SiO₂). Silicon dioxide is a chemical compound that includes crystalline silica sand (quartz), amorphous silica (non-crystalline), and silicates (aluminum silicate). Crystalline silica is the basic component of sand, quartz and granite rock. Crystalline is present in several forms, including quartz, tridymite and cristobalite. Crystalline silica quartz is the most common mineral in the earth’s crust and is recognized by its colorless crystals or white powders that are also colorless and tasteless.

Free crystalline silica if inhaled can cause a disease known as silicosis, which is characterized by the formation of scar tissue in the lung. This fibrotic process, if extensive, can cause difficulty in breathing and other pulmonary problems. The process of the disease varies greatly. Some individuals can show x-ray evidence of fibrosis and never develop any disability. The severity of the disease and the incidence of the disease in a population depend on the concentration of the dust the worker is exposed to as well as the length of the exposure period.

Since 1996, the Occupational Safety and Health Administration (OSHA) declared silica a Special Emphasis Program (SEP) in construction. The current OSHA PEL (permissible exposure limit) for respirable dust containing crystalline silica (quartz) for the construction industry is measured by millions of particles per cubic for (mppcf) and is calculated using the following formula: PEL = 250 mppcf / % silica +5. Over 30% of OSHA-collected silica samples from 1982 through 1991 exceeded the current PEL limit.

The Occupational Safety and Health Administration’s focus has been on trades that come in contact with or routinely work with products that contain silica. Concrete and masonry products typically contain silica sand. Since concrete and masonry are primary building materials, there are numerous ways for construction workers to be exposed. Job tasks in construction that would expose employees to silica would include:

- Abrasive blasting using silica sand as the abrasive
- Abrasive blasting of concrete
- Chipping, hammering, and drilling rock
- Crushing, loading, hauling, and dumping rock
- Chipping, hammering, drilling, sawing, and grinding concrete or masonry
- Demolition of concrete and masonry structures
- Dry sweeping or pressurized air blowing of concrete or sand dust
  The key to preventing silicosis is to keep dust out of the air. Dust controls can be as simple as a water hose to wet the dust before it becomes airborne. Use the following methods to control respirable crystalline silica:
  - Recognize when silica dust may be generated and plan ahead to eliminate or control the dust at the source. Awareness and planning are keys to prevention of silicosis.
  - Do not use silica sand or other substances containing more than 1% crystalline silica as abrasive blasting materials. Substitute less hazardous materials.
  - Use engineering controls and containment methods such as blast-cleaning machines and cabinets, wet drilling or wet sawing of silica-containing materials to control the hazard and protect adjacent workers from exposure.

Our safety evaluations, reports and recommendations are made solely to assist your organization in reducing hazards and the potential of hazards and accidents. These recommendations were developed from conditions observed and information provided at the time of our visit. They do not attempt to identify every possible loss potential, hazard or risk, nor do they guarantee that workplace accidents will be prevented. These safety evaluations, reports and recommendations are not a substitute for ongoing, well-researched internal safety and risk management programs. This report does not warrant that the property inspected and its operations are compliant with any law, rule or regulation.
• Routinely maintain dust control systems to keep them in good working order.
• Practice good personal hygiene to avoid unnecessary exposure to other worksite contaminants.
• Wear disposable or washable protective clothes at the worksite.
• Shower (if possible) and change into clean clothes before leaving the worksite to prevent contamination of cars, homes and other work areas.
• Conduct air monitoring to measure worker exposures and ensure that controls are providing adequate protection for workers.
• Use adequate respiratory protection when source controls cannot keep silica exposures below the OSHA PEL.
• Post warning signs to mark the boundaries of work areas contaminated with respirable crystalline silica.
• Provide workers with training that includes information about health effects, work practices and protective equipment for respirable crystalline silica.

To the right is an example of a control system utilizing water to wet dust down at the point of generation. Masons or concrete trades typically use gas-powered saws for cutting block or expansion joints in concrete. These saws can be adapted to cut wet. When sawing concrete or masonry block, water is applied to the blade, which is turn, wets the cut area.

Dust generated by the sawing action would become wet and would prevent particles from becoming airborne. Operations you are engaged in which use silica should be assessed and engineering methods explored for controlling dust generation. Many equipment suppliers are becoming sensitive to controlling this dust and are outfitting machining with controls to contain dust generation. Oftentimes older pieces of equipment can be retrofitted with these dust control devices. Consult the manufacturer. Always explore engineering controls first and if those are found unfeasible, administrative controls followed by the use of personal protective equipment.