

WORKPLACE SOLUTIONS

From the National Institute for Occupational Safety and Health

Reducing Hazardous Dust Exposure When Rock Drilling During Construction

Summary

Construction workers may be exposed to hazardous dust containing crystalline silica during site preparation when drilling systems are used. The National Institute for Occupational Safety and Health (NIOSH) found that drill dust could be decreased by using wet or dry dust reduction engineering controls, enclosed cabs, and implementing a dust control program.

grinding or cutting concrete, tuck-pointing masonry, using a jackhammer to break concrete, or when using drilling systems during construction. Rock drilling before blasting for highway construction may generate a large amount of dust containing crystalline silica. Also, rock drilling for other reasons during construction such as site preparation, pipeline installation, or water well drilling may generate hazardous dust (see Figure 1). Acute and accelerated cases of silicosis have been reported in rock drillers [NIOSH 1992]. NIOSH [1996]

noted that a drill operator working at a building site where no dust controls were used was exposed to 16 times the NIOSH recommended exposure level (REL).

NIOSH Studies and Controls

NIOSH has conducted studies in the construction and mining industries where rock drilling is done. Engineering controls and work practices identified in these studies help prevent

Description of Exposure

Breathing dust that contains crystalline silica can lead to silicosis, a deadly lung disease. No effective treatment exists for silicosis, but it can be prevented by controlling workers' exposures to dust containing crystalline silica. Exposure to crystalline silica has also been linked to lung cancer, kidney disease, reduced lung function, and other disorders [NIOSH 2002].

Many tasks in construction may generate dust containing crystalline silica:



Figure 1. Rock drilling without appropriate dust control.

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Figure 2. Dry dust control system working correctly.

silicosis by keeping dust containing crystalline silica out of the air workers may breathe (see Figure 2). NIOSH recommends that the same controls and work practices, described below, be used in construction activities where rock drilling may generate silica dust.

Under federal occupational safety and health regulations, employers have the responsibility for implementing engineering controls and administrative controls, providing personal protective equipment, and providing safety and health training for employees.

Site set-up

- Develop a site-specific safety and health plan. The plan should include guidance for recognizing when silica dust may be generated and describe strategies to control or eliminate dust. Include engineering controls, personal protective equipment, and work practices.
- During rock drilling operations, use wet or dry control systems to control dust. Wet systems are efficient but may freeze in the winter. Caution is advised when using wet systems in the presence of electrical energy sources. When purchasing equipment, look for dust controls. Always use the dust control system and keep it well maintained. Do not use equipment if the dust control system is not working properly.

- Establish a documented maintenance program for the dust control systems mentioned below. Dry systems require careful maintenance of the drill deck shroud. When changing filters, the use of respirators by workers may be appropriate.
- Take safety precautions to minimize the presence of workers near rock drilling. Also, use warning signs and barriers to separate workers, pedestrians, and vehicles from rock drilling equipment.
- Provide training to rock drillers and assistants in the use of controls and work procedures.
- During rock drilling, perform air monitoring of respirable crystalline silica exposures to make sure engineering controls are working and to determine whether workers need respiratory protection.

Engineering Controls

- Wet drilling systems pump water through the drill stem to prevent dust from being released into the air. The drill operator controls the flow using a control valve. Some drills are equipped with a flow meter. Raising the water flow will improve dust capture, but too much water will cause operational problems [Organiscak et al. 2003].

- Dry collection systems require an enclosure around the area where the drill stem enters the ground. The enclosure is made by hanging a rubber or cloth shroud from the underside of the drill deck. The enclosure is ducted to a dust collector that has a fan outside of the filter opposite the drill hole. The fan creates negative pressure inside the enclosure capturing dust as it leaves the hole during drilling. The dust is removed in the collector [Organiscak et al. 2003].
- When feasible, use rock drilling equipment with enclosed positive-pressure cabs with air conditioning and filtered air supply to isolate the operator from the dust. Older cabs can be retrofitted with systems that filter, heat, and cool the air.

Personal Hygiene, Protective Clothing, and Work Practices

- Wash hands and face before eating, drinking, or smoking. Do not eat, drink, or use tobacco products in the work area where construction activities are being performed.
- Change into disposable or washable work clothes at the worksite. If possible, shower and change into clean clothes before leaving the worksite to avoid contaminating cars, homes, and other work areas. If it is not possible to shower or change into clean clothes, use a vacuum with a high-efficiency filter to remove dust from clothes. An effective method to remove dust from clothing involves a booth under negative pressure that uses an air spray manifold to blow dust from clothing [Pollock et al. 2006]. Do not use a compressed air hose to remove dust from clothing.
- Park cars where they will not be contaminated with silica dust.
- Remove dust from equipment using a water hose rather than compressed air.

Respiratory Protection

- Use respiratory protection when needed. The controls cited in this report may greatly reduce worker exposure to dust; however, respirators may still be necessary to reduce exposure to crystalline silica below the NIOSH REL of $50\mu\text{g}/\text{m}^3$.
- Follow the Occupational Safety and Health Administration (OSHA) Respiratory Protection Standard (29 CFR

1910.134) www.osha.gov/SLTC/etools/respiratory/index.html). The provisions of the program include procedures for selection, medical evaluation, fit testing, training, use and care of respirators.

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*Code of Federal Regulations. See CFR in References.

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To receive copies of the NIOSH field study reports that formed the basis of this document or to obtain information about other occupational safety and health topics, contact NIOSH at

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