

# WORKPLACE SOLUTIONS

From the National Institute for Occupational Safety and Health

## Reducing Hazardous Dust in Enclosed Operator Cabs During Construction

### Summary

Construction workers may be exposed to hazardous dust containing silica when working in enclosed cabs during construction activities. The National Institute for Occupational Safety and Health (NIOSH) found that equipment operator exposure could be reduced by retrofitting air pressurization and filtration systems on existing cabs, using sweeping compounds on soiled floors, and implementing a dust control program.

### 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' exposure 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: grinding or cutting concrete, tuck-pointing masonry, using a jackhammer to break concrete, or using mobile excavation equipment (e.g., drills, loaders, graders, dozers, and trucks). Operator cabs used in the construction industry are meant to protect the equipment operator from excessive dust and noise. When the equipment is new, the controls on the cab are normally able to reduce dust exposures to an acceptable level (see Figure 1). However, as the equipment ages, many components of the control systems deteriorate (e.g., seals) and may cause the operator to be exposed to hazardous levels of dust. A study on an older enclosed cab used at surface coal mine noted respirable dust in the cab almost 13 times the NIOSH recommended exposure level (REL) [Cecala et al. 2004].

### NIOSH Studies

NIOSH has conducted studies of mining in the United States in cooperation with the Mine Safety and Health Administration (MSHA), mine operators, and equipment manufacturers to find the most cost-effective ways



**Figure 1.** Cab filtration and pressurization systems prevent dust from penetrating cabs.

to reduce operator exposure to dust in enclosed cabs [NIOSH 2008]. Engineering controls and work practices identified in these studies relate directly to mobile excavation equipment used in the construction industry. Therefore, NIOSH recommends that the same controls and work practices be used in mobile equipment for heavy construction.

The main sources of dust in an enclosed cab are from airborne dust at the worksite that leaks into a cab that is poorly sealed and from the material tracked into the cab by the operator. The two most important factors to achieve low dust concentrations in enclosed cabs were the use of an efficient air filtration system and an effectively sealed (tight) cab for positive inside cab pressurization.

## Controls

NIOSH and its partners have developed recommendations to help protect workers from exposure to crystalline silica dust during construction activities [Cecala et al. 2001; Cecala et al. 2005; NIOSH 1996; NIOSH 2001; NIOSH 2002]. The following guidelines for controlling hazardous dust when using enclosed cabs during construction activities are based on those recommendations.

### Site Set-Up

- Develop a site-specific safety and health plan. The plan should recognize when silica dust may be generated and plan ahead to control or eliminate dust. Include engineering controls, personal protective equipment, and work practices.
- Establish a documented maintenance program. Ensure that holes and cracks in the body of the cab are patched and door seals and gaskets are replaced as needed. If an electrostatic filter is used on the filtering system, change it on a regular basis as recommended by the filter manufacturer.
- Apply a gritless (i.e., without sand) natural-base sweeping compound on smooth enclosed cab floors to help bind up the dirt and soil tracked into the cab. The sweeping compound should be a natural-based type compound to reduce any operator irritation or allergic reaction to odors from petroleum-based oils and wax compounds. Before using any sweeping compound, review its Material Safety Data Sheet (MSDS) for hazardous ingredients and precautions.
- Provide training to enclosed cab operators in the use of controls and work procedures.
- During the use of the excavation equipment, perform periodic air monitoring of respirable crystalline silica exposures to make sure the engineering controls are working and to determine whether workers need respiratory protection.
- Minimize the number of workers on foot near mobile excavation equipment. Use barriers to separate workers, pedestrians, and vehicles from mobile excavation equipment. Ensure that mobile equipment

is not operated on grades steeper than those specified by the equipment manufacturer.

## Engineering Controls

- During construction activities, use water to reduce the amount of airborne dust generated or use a dust collection system if possible.
- Use mobile 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 heat, cool, and filter the air (see Figure 2).
- Do not position heaters or air-conditioning vents on the floor. If needed, they should be positioned in a high area of the cab where they are less likely to pick up dust from the floor or operator's clothing. It is best to configure a heating and air-conditioning unit into the clean air and pressurization system.
- Use an efficient air filtration system (high-efficiency intake and recirculation filters) to capture dust that is generated by the operator or other sources inside the cab.

## Personal Hygiene and Protective Clothing

- 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



**Figure 2.** Installation of a uni-directional cab filtration and pressurization system. The uni-directional system delivers all of the filtered air into the enclosed cab at the roof and pulls all the recirculated air from the cab floor into the main filtering unit to be re-cleaned.

clothes before leaving the worksite. 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.

- Park cars where they will not be contaminated with silica dust.
- Keep the cab doors and windows closed to keep the cab pressurized. The operator should remain in the enclosed cab whenever possible.
- An operator's clothing and boots should be kept as clean as possible.
- Do not remove dust from the enclosed cab by blowing with compressed air. Also, do not blow dust from clothing or skin with compressed air since this can resuspend the dust into a worker's breathing area.
- Practice good housekeeping. Equipment operators should clean the floors and walls on a periodic basis.
- If a sweeping compound is not used to clean the cab, do not use dry methods such as sweeping. Use a vacuum equipped with a high-efficiency filter or, if they do not create electrical or safety hazards, use wet methods to clean the cab.

## Respiratory Protection

The dust control cited in this report may greatly reduce worker exposure to hazardous 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](http://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

## References

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**For More Information**

The information in this document is based on NIOSH field studies. More information about silica hazards and controls is available on the NIOSH website at [www.cdc.gov/niosh/topics/silica/default.html](http://www.cdc.gov/niosh/topics/silica/default.html).

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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