WORKPLACE SOLUTIONS

From the National Institute for Occupational Safety and Health

Control of Hazardous Dust During Tuckpointing

Summary

Construction workers are exposed to hazardous dust when grinding or cutting mortar or cement from between the bricks of old buildings. The National Institute for Occupational Safety and Health (NIOSH) found that exposures could be reduced using tool-mounted local exhaust ventilation and work practices.

Description of Exposure

Workers who use grinders to remove deteriorated mortar between bricks (tuckpointing) may be exposed to crystalline silica at concentrations up to 100 times the NIOSH recommended exposure limit (REL) of 50 $\mu g/m^3$ [Shields 1999]. Breathing dust that contains silica can lead to the development of silicosis, a deadly lung disease. In addition, exposure to crystalline silica has been linked to lung cancer, kidney disease, reduced lung function, and other disorders [NIOSH 2002]. No effective treatment exists for silicosis, but it can be prevented by controlling workers' exposure to dust containing crystalline silica.

As brick buildings get older, the mortar between the bricks starts to fall apart and needs to be replaced to prevent water intrusion into the building. Before replacing the mortar, ½ to ¾ inch of the old mortar is removed by using a grinder. The grinder breaks up the mortar and turns it into airborne dust that may contain crystalline silica. The crystalline silica dust released during tuckpointing operations is very hard to control (Figure 1). The dust may be carried throughout the workplace. When workers use compressed air to clean their clothes, tools, and equipment, even more dust is added to the air.

Controls

NIOSH has identified control measures to reduce worker exposure to hazardous dust during tuckpointing. Studies [Heitbrink and Collingwood 2005; Collingwood and Heitbrink 2007] show how an industrial vacuum

Figure 1. Uncontrolled mortar removal generating hazardous exposure to dust.

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cleaner attached via a flexible hose to a shroud that partially encloses the grinding disk can reduce silica dust by 5 to 20 times during tuckpointing when compared with studies in which no dust controls were used.

Additional studies are needed to improve the design and effectiveness of this control. However, the interim guidelines below can be used to reduce exposure to workers who are tuckpointing and others near the work area. In addition, equipment maintenance and worker training should be part of a comprehensive silica control program.

Vacuum Cleaners

The choice of a vacuum cleaner depends on the task. The vacuum cleaner should draw at least 10 amps if it is to be used as part of a ventilated grinder system. Although a minimum air-flow rate of about 65 cubic feet per minute (cfm) provides adequate air flow, the objective is to provide an air flow of 80 cfm to achieve effective dust control. A vacuum cleaner with a cyclonic preseparator (cyclone) should be used to keep debris off the final filters. This will enable the vacuum cleaner to maintain an adequate airflow, which will facilitate dust capture and transport [Heitbrink and Bennett 2006]. Thus, it is very important to monitor the airflow rate. A vacuum cleaner equipped with a pressure gauge allows the worker to determine whether the airflow rate is too low to be effective. If the vacuum cleaner does not have a pressure gauge, workers can monitor the air flow by checking to see if a dust plume is escaping from around the shroud. The final filter should be a high-efficiency particulate air (HEPA) filter to reduce the chance of releasing dust containing crystalline silica from the vacuum into the worksite.

Hose

A 2-inch diameter hose with a smooth interior and a length of no more than 15 feet provides adequate air flow to capture and transport the mortar dust. The air flow provided by smaller diameter hoses (e.g., 1.5 inch) was far less than that provided by 2-inch diameter hoses. The hose should have as few elbows or turns as possible.

Shroud and Grinder

The exhaust shroud can be purchased separately or as a unit with the vacuum cleaner and hose. The shroud should totally enclose the spaces around the exhaust entry point for the hose. The shroud should have an entry point for the hose of 2 inches to match the diameter of the hose. Some tuckpointing grinders come with an attached shroud (e.g., Dust Director, Bosch Tuckpoint Grinder Model 1775E).

Work Practices

- Keep the exhaust entry point flat against the surface (Figure 2).
- Shake the hose as needed to loosen the settled dust and prevent the hose from clogging.
- Make sure no dust is escaping from the shroud.
  - — If dust is escaping, turn off the unit and clean or change the filter as recommended by the manufacturer.
  - — Try to dislodge the build-up on the filter by moving or shaking the vacum cleaner, or turning the motor off and on a few times. Build-up on the filters slows down the air flow through the system and reduces dust capture.
  - — Use a cyclonic pre-separator to keep the filter clean.
- Work against the rotation of the blade. The tool must be flat and positioned so that the dust from grinding is blown into the exhaust hose (Figure 3).
- Change vacuum cleaner bags before they leak, break, or cause too much resistance to air flow. Use appropriate personal protective equipment (PPE) such as a respirator when changing vacuum cleaner bags or filters.
- Put the vacuum cleaner below the work level to keep dust from falling out of the hose.

Figure 2. Keep the tool flat and positioned so that the dust from grinding is blown into the exhaust hose.

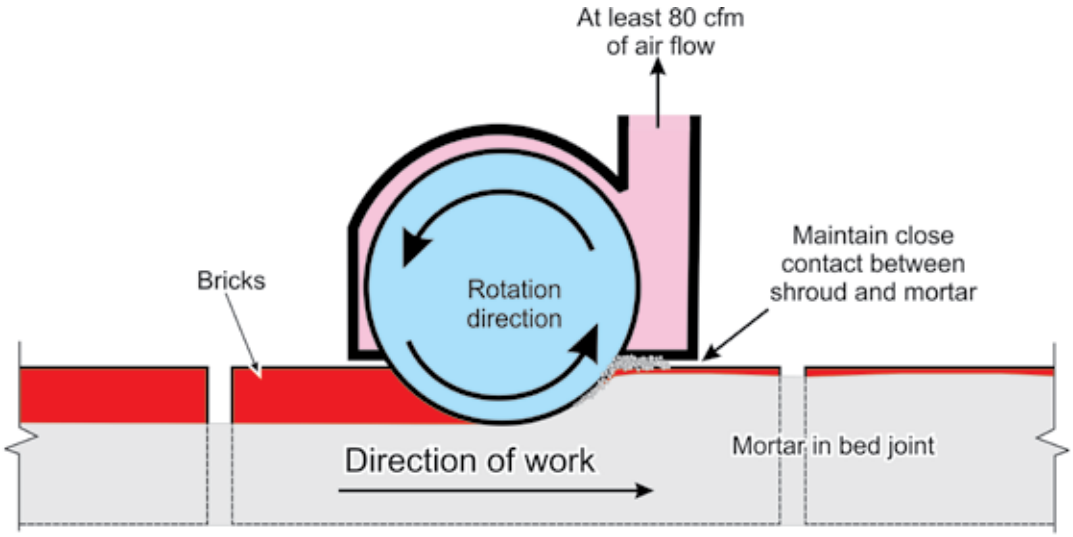

Figure 3. Diagram of mortar removal.

Respirators

When tuckpointing in poorly ventilated areas such as in corners or inside buildings, workers and employers should be aware that there is an increased risk of exposure to high concentrations of hazardous dust. Also, there is the potential for increased exposure to hazardous dust when tuckpointing on surfaces that are in poor condition.

The dust control cited in this report may greatly reduce worker exposure to hazardous dust; however, respirators are still necessary to reduce exposure to crystalline silica below the NIOSH REL of 50$\mu g/m^3$. It may be possible to use less restrictive respirators since the amount of hazardous dust has been decreased by the control. Exposure monitoring is necessary to determine what type of respirator is needed. Employers should follow the Occupational Safety and Health Administration (OSHA) Respiratory Protection Standard (29 CFR 1910.134) (www.osha.gov/SLTC/etools/respiratory/index.html).

Equipment Manufacturers

Equipment manufacturers should consider the recommendations in this report when developing new grinders or controls.

Acknowledgments

The principal contributors to this publication were William Heitbrink of the University of Iowa and Scott Collingwood from the University of Utah. John Whalen, under a contract with the U.S. Public Health Service, Division of Federal Occupational Health, served as lead writer/editor.

References

Collingwood S, Heitbrink WA [2007]. Field evaluation of an engineering control for respirable crystalline silica exposures during mortar removal. J Occup Environ Hyg *4*:875–887.

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For More Information

NIOSH has previously published recommendations to help protect workers from exposure to crystalline silica dust during construction activities.

NIOSH [1996]. NIOSH Alert: request for assistance in preventing silicosis and deaths in construction workers. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, DHHS (NISOH) Publication No. 96–112.

Additional information about silica hazards and controls is available on the NIOSH Web site at www.cdc.gov/niosh/topics/silica/default.html.

To obtain information about other occupational safety and health topics, contact NIOSH at

Telephone: 1–800–CDC–INFO (1–800–232–4636)
TTY: 1–888–232–6348 ▪ E-mail: cdcinfo@cdc.gov

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DHHS (NIOSH) Publication No. 2008—126
(Supersedes 2000–113)