

EBERT CONSTRUCTION

CRYSTALLINE SILICA EXPOSURE CONTROL PLAN PROGRAM & PROCEDURE

LAST UPDATED: SEPTEMBER 2017



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PURPOSE

Ebert Construction is committed to providing a safe and healthy workplace to our employees, recognizing the right of workers to work in a safe and healthy work environment and ensuring that Ebert Construction's activities do not adversely affect the health and safety of any other persons.

This commitment includes ensuring every reasonable precaution is taken to protect our employees (and others) from the adverse health effects associated with exposure to silica.

INTRODUCTION

Silica is the second most common mineral on earth, found in the common form as "sand" and "rock". Silica is the compound formed from the elements silicon (Si) and oxygen (O) and has a molecular form of SiO₂. The three main forms or 'polymorphs' of silica are alpha quartz, cristobalite and tridymite. The polymer most abundant and most hazardous to human health is alpha quartz, and is commonly referred to as crystalline silica.

HEALTH HAZARDS ASSOCIATED WITH SILICA EXPOSURE

The health hazards of silica come from breathing in the dust. If crystalline silica becomes airborne through industrial activities, exposures to fine crystalline silica dust (specifically exposure to the size fraction that is considered to be respirable) can lead to a disabling, sometimes fatal disease called silicosis. The fine particles are deposited in the lungs, causing thickening and scarring of the lung tissue. The scar tissue restricts the lungs' ability to extract oxygen from the air. This damage is permanent, but the symptoms of the diseases may not appear for many years. As noted in the following Figure, respirable silica dust is very small, and is not visible to the human eye.

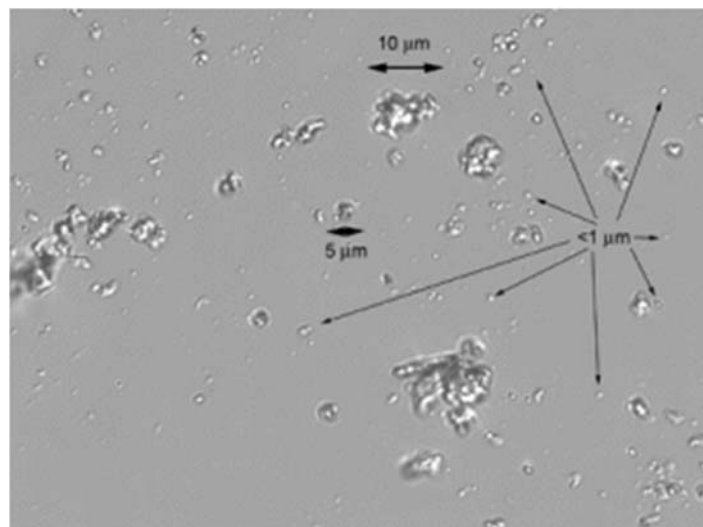


Figure 1: Crystalline silica up close. 1000 times magnification of sand dust. These particles are small enough to be trapped in lung tissue.

A worker may develop any of three types of silicosis, depending on the concentration of silica dust and the duration of the exposure:

- Chronic Silicosis: Develops after 10 or more years of exposure to crystalline silica and relatively low concentrations.
- Accelerated Silicosis: Develops 5 to 10 years after initial exposure to crystalline silica at high concentrations.
- Acute Silicosis: Develops within weeks, or 4 to 5 years, after exposure to very high concentrations of crystalline silica.

Initially, workers with silicosis may have no symptoms; however, as the disease progresses, workers may experience:

- Shortness of Breath.
- Severe Cough.
- Weakness.

These symptoms can worsen over time and lead to death. Exposure to silica has also been linked to other diseases, including bronchitis, tuberculosis, and lung cancer.

POTENTIAL SILICA EXPOSURES AT EBERT CONSTRUCTION

Some of the activities performed on Ebert Construction projects have the potential to create/release of silica dust, thus exposing our employees. These activities include, but are not necessarily limited to:

- Sweeping
- Jack-hammering
- Saw-cutting
- Drilling (of concrete)
- General Selective Demo

RESPONSIBILITIES

Due to the risk posed by respirable silica, it is critical that all personnel involved in activities that could potentially create silica dust take specific actions to ensure that, as much as practicable, a hazard is not created. In recognition of this, the following (Silica related) responsibilities have been established and must be adhered to.

MANAGEMENT

Is responsible for:

- Regularly evaluating new equipment and technologies that become available, as able/appropriate, purchasing the “best available” equipment/technologies (within Ebert Construction’s capabilities). Equipment/technologies with (silica) dust suppression and/or capture technologies will generally be given preference over equipment/technologies that lack such.
- Implementing a suitable respirable silica exposure monitoring program, or otherwise ensuring representative exposure monitoring results are available. The purpose of the program will ensure that (over time) Ebert Construction has quantifiable silica exposure data available for all regularly occurring, as well as reasonably foreseeable, work activities.

- Ensuring project and/or task specific Exposure Control Plans (ECPs) are developed, communicated and effectively implemented as appropriate. (See Appendix A)
- Ensuring that all employees (i.e. Managers, Supervisors and Workers) receive the necessary education and training related to this Policy, as well as project/task specific ECPs.
- Maintaining applicable records (i.e. exposure sampling, inspections, respirator fit tests, training records, etc.) in accordance with Ebert Construction's record retention procedures/practices.
- In conjunction with the Ebert Construction's Health & Safety Committee; conducting a review of this Policy, as well as: (1) project/task specific ECP's, (2) available exposure monitoring data, (3) Industry/Regulatory information, and (4) new/emerging equipment/technologies on a regular (i.e. annual) basis.

SUPERVISORS

Are responsible for:

- Obtaining a copy of the project/task specific ECPs (and/or other similar such information), and ensuring such are made available at each work site.
- Ensuring that all the tools, equipment, PPE and materials (including water) necessary to implement the ECP is available (and in good working order) prior to allowing work activities to commence.
- Ensuring that all workers (under the supervisor's direction and control) have received the necessary education and training. As appropriate, each supervisor must ensure that workers are available to "demonstrate competency" for identified tasks.
- Ensuring that workers adhere to the project/task specific ECP, including PPE and personal hygiene (i.e. including be clean shaven where the respirator seals to the user's face) requirements.
- Coordinating work activities with the Owner/Prime Contractor as required, and/or otherwise implementing the controls necessary to protect others (i.e. erecting of barricades and signage) who could be adversely effected by Ebert Construction's acts (or omissions).
- The following foremen/field leaders have been determined to be competent; they have the knowledge and authority to make corrective actions.
 - Field Management
 - Current Superintendents
 - Current Foreman

EMPLOYEES

Are responsible for:

- Knowing the hazards of silica dust exposure.
- Using the assigned protective equipment in an effective and safe manner.
- Working in accordance with the project/task specific ECP.
- Reporting (immediately) to their supervisor, any hazards (i.e. unsafe conditions, unsafe acts, improperly operating equipment, etc.).

EXPOSURE LIMITS

The Occupational Health & Safety Administration (OSHA) silica standard requires employers to limit worker exposures to respirable crystalline silica and to take other steps to protect workers. OSHA has reduced the permissible exposure limit (PEL) for respirable crystalline silica to 50 micrograms per cubic meter of air (ug/m³), averaged over an 8-hour shift.

The OSHA standard allows employers to either use a control method laid out in Table 1, or measure workers' exposure to silica and independently decide which dust controls work best to limit exposures below the permissible exposure limit (PEL) in their workplaces.

Ebert Construction will ensure that no employee is exposed to an airborne concentration of respirable crystalline silica in excess of the PEL. Ebert Construction intends to accomplish this by either adhering to the guidance established Table 1 or by conducting exposure monitoring for those tasks not included in Table 1 to determine workers' exposure and the appropriate control methods.

RISK IDENTIFICATION

Silica can be found in many of the products used/encountered on Ebert Construction's Projects. For example, the Lafarge Concrete Materials Safety Data Sheet (MSDS) reveals the potential for it to contain up to 90% crystalline silica. Therefore (silica) dust can be readily released through the various tasks performed by Ebert Construction involving concrete products.

The health hazards of silica come from breathing in the dust. In addition to identifying the specific activities/areas where personnel could be exposed to silica dust, the "amount" of exposure and "duration" of exposure must also be considered. With consideration to these three factors, activities performed by Ebert Construction (or that are otherwise occurring in proximity to Ebert Construction's activities) that expose our employees (as well as members of the public and other workers) to the dust include, but are not necessarily limited to:

- Sweeping
- Jack-hammering
- Saw-cutting
- Drilling (of concrete)
- General Selective Demo

RISK ASSESSMENT

Ebert Construction will use a variety of methods to assist with the "assessment" of (possible and actual) silica exposures. These methods will include, but may not necessarily be limited to:

- Regularly consulting with the Safety Resources/Safety Managers from firms who perform similar work
- Implementing a suitable respirable silica exposure monitoring program. This program will ensure that (over time) Ebert Construction has quantifiable silica exposure data available that is representative of all regularly occurring, as well as reasonably foreseeable work activities.

RISK CONTROL

Control Methods: When determining measures to reduce or eliminate worker exposure to silica dust, Ebert Construction will generally select a combination of controls, listed in order of preference:

- Adhering to OSHA's Table 1 (see Appendix B)
- Substitution and elimination
- Engineering controls
- Administrative controls
- Personnel Protection Equipment (PPE)

Substitution and Elimination: Whenever possible, Ebert Construction will substitute products containing silica with products that do not contain (or contain a lower percentage of) crystalline silica. While there have historically been few "substitution" options available, Ebert Construction recognizes the importance of planning work in order to minimize the amount of silica dust generated. During the planning phases of a project, Ebert Construction will advocate for the use of methods that reduce the need for cutting, grinding, or drilling of concrete surfaces.

Engineering Controls: Engineering controls are those controls which aim to control or otherwise minimize the release of crystalline silica. Two "common" engineering control options are available to Ebert Construction in many circumstances. These include the Local Exhaust Ventilation (LEV) and Wet Dust Suppression (WDS) systems.

Local Exhaust Ventilation (LEV) Systems: Tools/appliance specific LEV systems are available on some tools/appliances. Such LEV systems are generally comprised of a shroud assembly, a hose attachment, and a vacuum system. Dust-laden air is collected within the shroud, drawn into the hose attachment, and conveyed to the vacuum, where it is filtered and discharged. "Large scale" LEV systems, such those available on some Vacuum Trucks and Mobile Sweepers, may also be employed (at times) on Ebert Construction projects.

When/if LEV systems are used, Ebert Construction will employ the following systems and safe work practices:

- Vacuum attachment systems that capture and control dust at its source whenever possible.
- Dust control systems will be maintained in optimal working condition.
- Grinding wheels will be operated at the manufacturer's recommended RPM (operating in excess of this can generate significantly higher airborne dust levels).
- HEPA or good quality, multi-stage vacuum units (approved for use with silica dust) will be used in accordance with the manufacturer's instructions.
- Whenever possible, concrete grinding will be completed when the concrete is wet (thus dust release will be significantly reduced).

Wet Dust Suppression (WDS) Systems: Unlike LEV systems, many tools/appliances at Ebert Construction are equipped with WDS systems (i.e. on the Milling equipment, sweeper equipped Bobcats, as well as attachments on various hand held/portable, abrasive/cutting equipment). When WDS Systems are not available, (as a standard or retrofitted part of a tool/appliance), similar effects can also be achieved by manually wetting the surface (i.e. with a mister or with a hose).

When WDS systems are used, Ebert Construction will employ the following systems and safe work practices:

- If water is not readily available on a specific project, the project supervisor will arrange to have a water tank delivered to the site for use.
- Pneumatic or fuel (i.e. gasoline) powered equipment will generally be used instead of electrically powered equipment if water is the method of dust control, unless the electrical equipment is specifically designed to be used in such circumstances.
- Pressure and flow rate will be controlled in accordance with the tool manufacturer's specifications.
- When sawing concrete, tools that provide water directly to the blade will be used if possible.
- Wet slurry will be cleaned from work surfaces when the work is complete, if/when necessary.

Administrative Controls: Administrative controls are those that aim to control or otherwise minimize the release of silica through the use of work procedure and work methods, rather than by affecting the actual physical work. Common examples of administrative controls include, but are not limited to:

- Posting of warning signs.
- Rescheduling of work as to avoid the activities of others.
- Relocating unprotected workers away from dusty areas.

When administrative controls are used, Ebert Construction will employ the following systems and safe work practices:

- In conjunction with the Owner/Prime Contractor, suitable exposure control strategies (both within and outside Ebert Construction's capabilities/responsibilities) will be discussed and determined. As necessary/appropriate, supplemental (to this policy/procedure) project and task specific Exposure Control Plans will be developed.
- Suitable housekeeping, restricted work area, hygiene practices, training and supervision procedures/standards will be determined and implemented on Ebert Construction projects.
- As appropriate, barriers will be erected around known silica dust generating activities, and/or warning signs will be posted.
- As able, work activities will be scheduled to minimize the silica related effect on, and from, others.

Personal Protective Equipment Controls: When used in conjunction with the other controls elsewhere identified (i.e. Engineering and Administrative), personal protective equipment and clothing can help further reduce our employee's exposure to silica dust.

An air purifying respirator fitted with HEPA cartridges is the most common piece of PPE that would be used by Ebert Construction to minimize exposure to silica dust. Dependent on the effectiveness of the other (i.e. engineering) control measures employed, either a "full face piece" or "1/2 face piece" respirator would be used by personnel (In the majority of situations a 1/2 face respirator will be used. When working indoors or in other areas with poor ventilation, a full face respirator may be required). Both of these respirators are "seal dependent", and thus the users must be "fit tested" and clean shaven where the respirator seals to the face.

In addition to respiratory PPE, protective clothing (i.e. disposable/washable coveralls) may be used and/or required to help prevent the contamination of the worker's personnel clothing.

The above controls will be implemented by referencing and following OSHA's Table 1 (Appendix B).

MEDICAL SURVEILLANCE

Ebert Construction will offer **medical exams**—including chest X-rays and lung function tests—every three years for any workers who are required by the OSHA silica standard to wear a respirator for 30 or more days per year.

Initial examination: Ebert Construction will make available an initial (baseline) medical exam within 30 days after initial assignment which will include the following:

- A medical and work history, with emphasis on: past, present, and anticipated exposure to respirable crystalline silica, dust, and other agents affecting the respiratory system
- Any history of respiratory system dysfunction, including signs and symptoms of respiratory disease (e.g., shortness of breath, cough, wheezing); history of tuberculosis; and smoking status and history;
- A physical examination with special emphasis on the respiratory system;
- A chest X-ray
- A pulmonary function test
- Testing for latent tuberculosis infection; and
- Any other tests deemed appropriate by the PLHCP (Primary licensed healthcare provider).

Periodic examinations: Ebert Construction will make available periodic medical examinations at least every three years, or more frequently if recommended by the PLHCP.

In addition, Ebert Construction shall provide additional information as required by the OSHA Silica Standard, such as:

- Providing requisite information to the PLHCP (employee job duties, occupational exposure, description of PPE used, employment-related medical examinations,
- Providing a copy of the PLHCP's written medical report to the employee explaining the results of the medical exam.

EDUCATION AND TRAINING

Prior to performing activities, or working on project sites where personnel could be exposed to silica dust, Ebert Construction will ensure that personnel receive suitable education and training. As necessary, personnel will be trained to a level of “demonstrated competency”. While not necessarily an exhaustive list, education and training may include:

- The hazards and risks associated with exposure to silica dust.
- The signs and symptoms of silica related diseases.
- General and specific silica exposure reduction methods/strategies (i.e. as detailed in the general/specific exposure control plans).
- The use of specific pieces of equipment and control systems (i.e. LEV and WDS systems).
- The use and care of respiratory and other personal protective equipment.
- How to seek first aid (i.e. for respiratory related concerns, including those that may be caused/associated with silica dust exposure), and
- How to report items of the concern (i.e. those related to silica dust).

The education and training detailed will be delivered to Ebert Construction employees through a variety of forums, including but not necessarily limited to:

- New Employee Orientation.
- Project/Site Specific Orientation.
- Equipment/task specific training (in accordance with Ebert Construction’s Policy, all personnel must be trained to a level of “demonstrated competency” prior to using required tools, equipment and appliances).
- Start of shift “tool box talks”.
- Notifications and Bulletins (those developed in house and those acquired from other reputable sources).

SAFE WORK PROCEDURES

Ebert Construction will ensure that suitable written procedures for controlling the risk of silica exposure are developed. This document/table summarizes the silica control options generally available on Ebert Construction sites/projects, and will be complimented with project/tasks specific Exposure Control Plans as necessary. This document and any supplemental work procedures/ECPs will be made readily available for review by all affected workers.

As a general rule, Ebert Construction will be following the guidelines and directions noted in Table 1. (See task specific Written Exposure Control Plans in Appendix A.)

DOCUMENTATION

In accordance with Record/Statistics Procedures detailed in the latest revision of Ebert Construction's "Health & Safety Manual", records associated with Crystalline Silica Program will be maintained in accordance with the following:

Record Type	Location(s)
Silica Policy, Program and Procedure	Main Office / Jobsite
Project/Task Specific Silica ECPs	Main Office
Exposure Monitoring Results	Main Office
Workplace Inspections	Main Office / Jobsite
First Aid Records/Reports of Exposure	Main Office / Jobsite
Incident Investigation Reports	Main Office
Respirator Fit Tests	Main Office / Jobsite
Equipment Maintenance and Repair Logs	Main Office
New Employee Orientation Records	Main Office
Site/Project Orientation Records	Main Office
Tool Box Talk Records	Main Office / Jobsite
Crew Safety Meeting Records	Main Office / Jobsite
Job/Task Specific Training Records	Main Office

*LOP – Length of Project



*LOE – Length of Employment

*LOS – Length of Service

APPENDIX A

TABLE 1 CONTROL METHODS

**TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS
WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†**

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(i) Stationary masonry saws</p> 	<p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p>	None	None	<p>Water Controls:</p> <ul style="list-style-type: none"> ■ An adequate supply of water for dust suppression is used; ■ The spray nozzle is working properly to apply water at the point of dust generation; ■ The spray nozzle is not clogged or damaged; and ■ All hoses and connections are intact.
<p>(ii) Handheld power saws (any blade diameter)</p> 	<p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <ul style="list-style-type: none"> ■ When used outdoors. ■ When used indoors or in an enclosed area. 	None APF 10	None APF 10 APF 10	<p>Water Controls:</p> <ul style="list-style-type: none"> ■ An adequate supply of water for dust suppression is used; ■ The spray nozzle is working properly to apply water at the point of dust generation; ■ The spray nozzle is not clogged or damaged; ■ All hoses and connections are intact.

‡ The water delivery system is not required to be integrated or mounted on the tool; it can be assembled and installed by the employer. Acceptable water delivery systems include direct connections to fixed water lines or portable water tank systems. These water delivery systems can be operated by one worker or could require a second worker to supply the water at the point of impact.







TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†				
Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does full and proper implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less) 	For tasks performed <u>outdoors only</u> : <ul style="list-style-type: none"> ■ Use saw equipped with commercially available dust collection system. ■ Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. ■ Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency. 	None	None	Dust Collection Systems: <ul style="list-style-type: none"> ■ The shroud or cowl is intact and installed in accordance with the manufacturer's instructions; ■ The hose connecting the tool to the vacuum is intact and without kinks or tight bends; ■ The filter(s) on the vacuum are cleaned or changed in accordance with the manufacturer's instructions to prevent clogging; and ■ The dust collection bags are emptied to avoid overfilling.
(iv) Walk-behind saws 	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. <ul style="list-style-type: none"> ■ When used outdoors. ■ When used indoors or in an enclosed area. 	None APF 10	None APF 10	Water Controls: <ul style="list-style-type: none"> ■ An adequate supply of water for dust suppression is used; ■ The spray nozzles are working properly to apply water at the point of dust generation; ■ The spray nozzles are not clogged or damaged; and ■ All hoses and connections are intact.

TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†				
Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does full and proper implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
(v) Drivable saws 	For tasks performed <u>outdoors only</u> : <ul style="list-style-type: none"> ■ Use saw equipped with integrated water delivery system that continuously feeds water to the blade. ■ Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. 	None	None	Water Controls: <ul style="list-style-type: none"> ■ An adequate supply of water for dust suppression is used; ■ The spray nozzles produce a pattern that applies water at the point of dust generation; ■ The spray nozzles are not clogged or damaged; and ■ All hoses and connections are intact.
(vi) Rig-mounted core saws or drills 	<ul style="list-style-type: none"> ■ Use tool equipped with integrated water delivery system that supplies water to cutting surface. ■ Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. 	None	None	Water Controls: <ul style="list-style-type: none"> ■ An adequate supply of water for dust suppression is used; ■ The spray nozzles produce a pattern that applies water at the point of dust generation; ■ The spray nozzles are not clogged or damaged; and ■ All hoses and connections are intact.


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WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†**

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills)</p> 	<ul style="list-style-type: none"> ■ Use drill equipped with commercially available shroud or cowling with dust collection system. ■ Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. ■ Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. ■ Use a HEPA-filtered vacuum when cleaning holes. 	None	None	<p>Dust Collection Systems:</p> <ul style="list-style-type: none"> ■ The shroud or cowling is intact and installed in accordance with the manufacturer's instructions; ■ The hose connecting the tool to the vacuum is intact and without kinks or tight bends; ■ The filter(s) on the vacuum are cleaned or changed in accordance with the manufacturer's instructions; and ■ The dust collection bags are emptied to avoid overfilling.


**TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS
WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†**

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(viii) Dowel drilling rigs for concrete</p> 	<p>For tasks performed <u>outdoors only</u>:</p> <ul style="list-style-type: none"> ■ Use shroud around drill bit with a dust collection system. Dust collector must have a filter with 99% or greater efficiency and a filter-cleaning mechanism. ■ Use a HEPA-filtered vacuum when cleaning holes. 	APF 10	APF 10	<p>Dust Collection Systems:</p> <ul style="list-style-type: none"> ■ The shroud is intact and installed in accordance with the manufacturer's instructions; ■ The hose connecting the tool to the vacuum is intact and without kinks or tight bends; ■ The filter(s) on the vacuum are cleaned or changed in accordance with the manufacturer's instructions; and ■ The dust collection bags are emptied to avoid overfilling.


**TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS
WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†**

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(ix) Vehicle-mounted drilling rigs for rock and concrete</p> 	<p>Use dust collection system with close capture hood or shroud around drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector.</p> <p align="center">OR</p> <p>Operate from within an enclosed cab and use water for dust suppression on drill bit.</p>	<p>None</p>	<p>None</p>	<p>Dust Collection Systems:</p> <ul style="list-style-type: none"> ■ The shroud or hood is intact and installed in accordance with the manufacturer's instructions; ■ The hose connecting the tool to the vacuum is intact and without kinks or tight bends; ■ The filter(s) on the vacuum are cleaned or changed in accordance with the manufacturer's instructions; and ■ The dust collection bags are emptied to avoid overfilling. <p>Water Controls:</p> <ul style="list-style-type: none"> ■ An adequate supply of water for dust Suppression is used; ■ The spray nozzles are working properly and produce a pattern that applies water on the discharge point from the dust collector; ■ The spray nozzles are not clogged or damaged; and ■ All hoses and connections are intact.


**TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS
WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†**

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(x) Jackhammers and handheld powered chipping tools</p> 	<p>Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.</p> <ul style="list-style-type: none"> ■ When used outdoors. ■ When used indoors or in an enclosed area. <p align="center">OR</p> <p>Use tool equipped with commercially available shroud and dust collection system.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.</p> <ul style="list-style-type: none"> ■ When used outdoors. ■ When used indoors or in an enclosed area. 	<p>None</p> <p>APF 10</p>	<p>APF 10</p> <p>APF 10</p>	<p>Water Controls[‡]:</p> <ul style="list-style-type: none"> ■ An adequate supply of water for dust suppression is used; ■ The water sprays are working properly and produce a pattern that applies water at the point of dust generation; ■ The spray nozzles are not clogged or damaged; and ■ All hoses and connections are intact. <p>Dust Collection Systems:</p> <ul style="list-style-type: none"> ■ The shroud is intact and installed in accordance with the manufacturer's instructions; ■ The hose connecting the tool to the vacuum is intact and without kinks or tight bends; ■ The filter(s) on the vacuum are cleaned or changed in accordance with the manufacturer's instructions; and ■ The dust collection bags are emptied to avoid overfilling.


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WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†**

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(xi) Handheld grinders for mortar removal (i.e., tuckpointing)</p> 	<p>Use grinder equipped with commercially available shroud and dust collection system.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.</p>	APF 10	APF 25	<p>Dust Collection Systems:</p> <ul style="list-style-type: none"> ■ The shroud is intact, encloses most of the grinding blade, and is installed in accordance with the manufacturer's instructions; ■ The hose connecting the tool to the vacuum is intact and without kinks or tight bends; ■ The filter(s) on the vacuum are cleaned or changed in accordance with the manufacturer's instructions; ■ The dust collection bags are emptied to avoid overfilling; ■ The blade is kept flush against the surface whenever possible; and ■ The tool is operated against the direction of blade rotation, whenever practical.

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WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†**

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(xii) Handheld grinders for uses other than mortar removal</p> 	<p>For tasks performed <u>outdoors only</u>:</p> <p>Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p align="center">OR</p> <p>Use grinder equipped with commercially available shroud and dust collection system.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.</p> <ul style="list-style-type: none"> ■ When used outdoors. ■ When used indoors or in an enclosed area. 	None	None	<p>Water Controls⁵:</p> <ul style="list-style-type: none"> ■ An adequate supply of water for dust suppression is used; ■ The spray nozzles are working properly and produce a pattern that applies water at the point of dust generation; ■ The spray nozzles are not clogged or damaged; and ■ All hoses and connections are intact. <p>Dust Collection Systems:</p> <ul style="list-style-type: none"> ■ The shroud is intact and installed in accordance with the manufacturer's instructions; ■ The hose connecting the tool to the vacuum is intact and without kinks or tight bends; ■ The filter(s) on the vacuum are cleaned or changed in accordance with the manufacturer's instructions; and ■ The dust collection bags are emptied to avoid overfilling.

**TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS
WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†**

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(xiii) Walk-behind milling machines and floor grinders</p> 	<p>Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p align="center">OR</p> <p>Use machine equipped with dust collection system recommended by the manufacturer.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.</p> <p>When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.</p>	None	None	<p>Water Controls:</p> <ul style="list-style-type: none"> ■ An adequate supply of water for dust suppression is used; ■ The spray nozzles are working properly and produce a pattern that applies water at the point of dust generation; ■ The spray nozzles are not clogged or damaged; and ■ All hoses and connections are intact. <p>Dust Collection Systems:</p> <ul style="list-style-type: none"> ■ The hose connecting the tool to the vacuum is intact and without kinks or tight bends; ■ The filter(s) on the vacuum are cleaned or changed in accordance with the manufacturer's instructions to prevent clogging; and ■ The dust collection bags are emptied to avoid overfilling.

**TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS
WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†**


Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(xiv) Small drivable milling machines (less than half-lane)</p> 	<p>Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant.</p> <p>Operate and maintain machine to minimize dust emissions.</p>	None	None	<p>Water Controls:</p> <ul style="list-style-type: none"> ■ An adequate supply of water for dust suppression is used; ■ The spray nozzles are working properly and produce a pattern that applies water at the point of dust generation; ■ The spray nozzles are not clogged or damaged; and ■ All hoses and connections are intact.


TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†				
Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(xv) Large drivable milling machines (half-lane and larger)</p> 	<p>For cuts of any depth on asphalt only:</p> <p>Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.</p> <p>Operate and maintain machine to minimize dust emissions.</p> <p>For cuts of four inches in depth or less on any substrate:</p> <p>Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.</p> <p>Operate and maintain machine to minimize dust emissions.</p> <p>OR</p> <p>Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant.</p> <p>Operate and maintain machine to minimize dust emissions.</p>	None	None	No additional information provided. Refer to the engineering and work practice control methods outlined.
		None	None	
		None	None	


TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†				
Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does <i>full and proper</i> implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
<p>(xvi) Crushing machines</p> 	<p>Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points).</p> <p>Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station.</p>	None	None	<p>Water Controls††:</p> <ul style="list-style-type: none"> ■ Nozzles are located upstream of dust generation points and positioned to thoroughly wet the material; ■ The volume and size of droplets is adequate to sufficiently wet the material (optimal droplet size is between 10 and 150 µm); and ■ Spray nozzles are located far enough from the target area to provide complete water coverage but not so far that the water is carried away by wind.



TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†				
Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does full and proper implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
(xvii) Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials** 	Operate equipment from within an enclosed cab. When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None	No additional information provided. Refer to the engineering and work practice control methods outlined.

TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA†				
Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)		What does full and proper implementation require?*
		≤ 4 hours /shift	> 4 hours /shift	
(xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: demolishing, abrading, or fracturing silica-containing materials 	Apply water and/or dust suppressants as necessary to minimize dust emissions. OR When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None	None	The following scenarios are examples of when the employer must use water and/or dust suppressants as necessary to minimize dust emissions: ■ Equipment for grading and excavating is not equipped with enclosed, pressurized cabs. OR ■ Employees other than the operator are engaged in the task. If water or dust suppressants are applied as necessary to minimize visible dust, the employer need not provide an enclosed, filtered cab for the operator.

APF 10 (requires fit testing)		APF 25	
			
Dust Mask/Half Mask	Half Mask (Elastomeric)	Loose-Fitting Powered Air-Purifying Respirator (PAPR)	Hooded Powered Air-Purifying Respirator (PAPR)