

BGSU

Bowling Green State University

Silica Exposure Control Plan

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Introduction

Forward

In 1970, the United States Congress established the right of workers to "safe and healthful working conditions" through the Occupational Safety and Health Act. This act created the Occupational Safety and Health Administration (OSHA). House Bill 308 incorporates by reference all federal OSHA standards found in the Code of Federal Regulations (CFR), Title 29 Parts 1910, 1926 and 1928 as Ohio Public Employment Risk Reduction Standards. All adopted Ohio Public Employment Risk Reduction Standards are found in Chapter 4167 of the Ohio Revised Code and the Ohio Administrative Code.

This plan has been established by Bowling Green State University (BGSU) to comply with OSHA's Respirable Crystalline Silica standards, 29 CFR 1910.1053 and 1926.1153.

Objective

Chronic exposure to dust containing respirable crystalline silica (RCS) has been shown to result in Silicosis, an irreversible illness of the lungs, as well as other health effects. RCS is very small particles of crystalline silica, at least 100 times smaller than ordinary sand one may find on beaches and can be created when disturbing crystalline silica containing products in ways mentioned in the **Applicability** section below. Additionally, crystalline silica has been classified as a human lung carcinogen. Because of this, BGSU's Environmental Health and Safety (EHS) department has worked with various departments across campus to identify tasks involving the disturbance of products that may contain crystalline silica, obtained tools and implemented engineering and work practice controls to minimize airborne exposures to RCS, performed exposure assessments where needed, and trained affected staff. This plan outlines all of that information and serves as a reminder to staff on how to engage in applicable tasks safely.

Applicability

This plan applies to all BGSU employees who work with any of the following materials in a way that could create a dust:

- Asphalt
- Brick
- Cement
- Concrete
- Concrete Block
- Drywall
- Fiber Cement Products
- Grout
- Guniting/Shotcrete
- Mortar
- Paints Containing Crystalline Silica
- Plaster
- Refractory Mortar/Castables
- Refractory Units
- Rock
- Roof Tile (Concrete)
- Sand (including Frac Sand)
- Soil (fill dirt, top soil, soil with fly ash added)
- Stone (granite, limestone, quartzite, sandstone, shale, slate, cultured, etc.)
- Stucco/EIFS
- Terrazzo
- Tile (clay and ceramic)
- Other (any product displaying crystalline silica as an ingredient on the label/safety data sheet)

If contractors will be disturbing any of the materials above, they are bound by the same regulations that BGSU employees are. This means they should have and follow their own written plan detailing how safe exposure levels of RCS will be maintained while engaging in applicable tasks on BGSU's premises. While BGSU's plan is geared directly towards BGSU employees, there are a few things BGSU asks of Project Managers (PM) employing contractors and of contractors directly. See the **Responsibilities** section below. The list below is not exhaustive but includes some of the more common ways in which these materials can be disturbed generating a dust:

- Abrasive blasting
- Bushhammering
- Cutting/Sawing
- Demolishing/Disturbing
- Drilling/Coring
- Earthmoving
- Frac sand cleanup, mixing, offloading, onloading, transferring
- Grinding
- Jackhammering
- Milling
- Mixing/Pouring
- Polishing
- Sacking/Patching
- Sanding
- Scabbling
- Scarifying
- Scraping
- Sweeping/cleaning up
- Well mixing/Pumping

Plan Enforcement

BGSU employees are required to comply with all aspects of this plan. A violation of a University employee's responsibility must be reported to the employee's supervisor for appropriate action. A violation of a contractor's responsibility must be reported to the appropriate BGSU Project Manager for action.

Responsibilities

Affected Employees

- Comply with the engineering and work practice controls outlined in this plan and any additional safety recommendations provided by supervisors and/or EHS to minimize the disturbance of and exposure to RCS.
- Contact your supervisor and/or EHS for questions and technical assistance.
- Where possible, work with products that do not contain crystalline silica.
- Ensure you have been informed and understand the hazards associated with exposure to RCS by completing Silica Exposure Control training upon hire and every 3 years thereafter as a refresher.
- Report any equipment, tool, and PPE needs or malfunctions to your supervisor.
- Use any required equipment, tools, and PPE in a manner that complies with instruction and training.
- Report any unsafe conditions/acts or near miss incidents to your supervisor.
- Report any exposure incidents or any signs or symptoms of illness associated with crystalline silica exposure.
- Follow guidelines on the proper use and limitations of control devices.
- Notify supervisor of any changes in the workplace that could cause an increase in exposure to RCS.

Supervisors of Affected Employees

- Implement and ensure engineering and work practice controls and procedures are followed in accordance with this plan.

- Ensure that staff are aware of this plan, instructed on the details of implementation, and provided with the appropriate equipment and methods of control (e.g. engineering controls, work practice controls, etc.).
- Notify EHS when a dust generating task that may contain crystalline silica must be performed and is not covered by the **Specified Exposure Control Methods (SECM)** section of this plan. An exposure assessment will need to be performed.
- Contact EHS to request technical assistance and to evaluate any health and safety concerns that arise within department.
- Ensure all reasonable precautions are taken to prevent exposure of bystanders and the general public when work involving RCS is performed.
- Ensure affected employees attend required Silica Exposure Control training.
- Make frequent and regular inspections of job/project sites, materials, and equipment to ensure RCS exposures are minimized and procedures are followed. Notify EHS of any deficiencies found. This also includes identifying existing and foreseeable RCS hazards in the workplace and taking prompt corrective measures to eliminate or minimize them.
- Continue to identify work operations and personnel that may require adherence to this plan.
- Provide affected new employees with informal on-the-job training about this plan.

Sr. Industrial Hygienist, EHS Department

- Review and update this Plan as necessary, not to exceed annually.
- Provide plan oversight, consultation, and training to all affected persons under this Plan regarding potential risks and exposure prevention to RCS.
- Perform exposure monitoring for BGSU employees to evaluate crystalline silica exposures, provide technical assistance with establishing new control measures, and assist in the development of worksite or task-specific Exposure Control Plans.
- Ensure worksite or task-specific Exposure Control Plans are developed, communicated, and effectively implemented where needed.
- Identify existing and foreseeable RCS hazards in the workplace and take prompt corrective measures to eliminate or minimize them.
- Maintain records as required by OSHA's RCS standards and other supporting standards.

Project Managers

This applies to anyone who hires a contractor to perform work for BGSU that may result in the creation of RCS. These individuals would be responsible for:

- Ensure contractors have developed and implemented Exposure Control Plans to adequately protect the campus community from exposures to RCS. These written plans need to be available upon request.
- Periodically monitor work activities to ensure these plans are being followed.
- If suitable air quality or controls cannot be achieved, review justification from contractor and provide approval if necessary, which may result in scheduling the work outside of normal business hours.

Contractors

- Compliance with all applicable OSHA RCS standards.
- The Exposure Control Plan must detail how potential exposure to the BGSU campus community and general public in adjacent areas will be kept below allowable exposure limits set forth by OSHA. A copy of this plan must be available to BGSU's PM upon request.
- If suitable air quality or controls cannot be achieved, contractor shall provide sound justification and receive approval from the PM before the work starts, which may result in scheduling the work outside of normal business hours

Plan Requirements

Initial Exposure Assessment

An initial exposure assessment is required when an employee needs to perform a task or use a tool that is not covered in the SECM section of this plan and the employee is or may reasonably be expected to be exposed to RCS at or above the OSHA action level, which is 25 micrograms per cubic meter of air. The action level represents half of the Permissible Exposure Level (PEL), which is the highest level of exposure an employee may be exposed to in a consecutive 8-hour period without incurring the risk of adverse health effects. Contact EHS for this assessment. This assessment can be accomplished in one of two ways:

1. *Performance option.* An assessment of the 8-hour time weighted average (TWA) exposure for each employee on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to RCS.
2. *Scheduled monitoring option.* An assessment of the 8-hour TWA exposure for each employee by taking one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, and in each work area.

Below is a list of tasks where scheduled monitoring occurred. In addition, an area sample was taken in the Ceramics main classroom while an advanced class was occurring to obtain general and typical classroom background levels. No 8-hour TWA's were found at or above the action level for the worst case scenario of work anticipated in an 8-hour work shift or time period.

Task	Department
Clay Baseball Field Prep	Grounds
Mixing Cement	Grounds
Sidewalk Grinding	Grounds
Making Investments	Glass, Fine Arts
Mixing Clay	Ceramics, Fine Arts
Standard Classroom Clean-Up	Ceramics, Fine Arts

NOTE: For more specifics on the scheduled monitoring depicted in this chart, please contact BGSU's EHS department.

Periodic Exposure Assessment

If initial exposure assessments are found at or above the action level but below the PEL in the future, exposure monitoring will be repeated within 6 months. If initial exposure assessments are found at or above the PEL in the future, exposure monitoring will be repeated within 3 months. Where the most recent (non-initial) exposure monitoring indicates that employee exposures are below the action level, monitoring will be repeated within six months of the most recent monitoring until two consecutive measurements, taken 7 or more days apart, are below the action level, at which time the monitoring can be discontinued for the exposure that was being assessed.

In addition, exposure monitoring will be conducted whenever there is a change in the process, control equipment, personnel, or work practices that may reasonably be expected to result in new or additional exposures at or above the action level.

Employee Notification

Any time exposure monitoring occurs (initial or periodic), the employees who participated will be notified in writing of the results of the assessment within 15 work days or the results will be posted in an appropriate location accessible to all affected employees. If the result is above the PEL, the notification will include the means that are being taken to reduce the exposure to below the PEL.

Engineering and Work Practice Controls

When employees will be utilizing a tool in the SECM section of this plan to perform a task, the engineering and work practice controls specified must be followed. In addition, employees must comply with the following:

1. Dry sweeping or dry brushing where such activity could contribute to employee exposure to RCS is prohibited unless wet sweeping, HEPA-filtered vacuuming or other methods that minimize the likelihood of exposure are not feasible.
2. Cleaning clothing or surfaces with compressed air where such activity could contribute to employee exposure to RCS is prohibited unless:
 - a. The compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air; or
 - b. No alternative method is feasible.

Training

Even though there is no knowledge of employee exposures at or above the action level for RCS, all employees who disturb or have the potential of disturbing crystalline silica containing products are required to complete Silica Exposure Control training prior to engaging in those activities with a refresher course every 3 years thereafter. At a minimum, this awareness training will include:

- The health hazards associated with exposure to RCS;
- A reminder to check labeling for crystalline silica containing products as well as accessing safety data sheets for more information;
- Specific tasks in the workplace that could result in exposure to RCS;
- Specific engineering and work practice controls BGSU has implemented to protect employees from exposure to RCS; and
- The contents of applicable standards and this plan.


Specified Exposure Control Methods

The contents contained in Table 1 below was developed using the information and direction in OSHA's construction standard for RCS. If an employee needs to use a tool listed in Table 1 below on a product that contains or may contain crystalline silica, the engineering and work practice control methods must be followed to keep RCS exposures at safe levels. It is the supervisor's responsibility to ensure these controls are followed as specified. In all cases, be sure to operate and maintain the tool in accordance with the manufacturer's instructions to help minimize dust emissions. If the engineering control is not available, the work practices are infeasible, or the tool to be used is not listed below, contact EHS for an initial exposure assessment.

IMPORTANT NOTES:



1. In some cases, even when the designated engineering and work practice control methods are followed, respiratory protection is required as indicated in Table 1 below by APF 10 and APF 25 designations (pictures below to illustrate). "APF" stands for "assigned protection factor", which is the level of protection that the device provides the user. Respiratory protection requirements are highlighted in the



Table below. EHS is not aware of any BGSU employees engaging in the highlighted activities at this time. If BGSU employees will be engaging in these activities in the future, contact EHS because those employees will need to be added to the university's Respiratory Protection Program, which requires initial and periodic medical clearance and annual training and fit testing. Also, additional sections of the OSHA RCS standards will apply that have not been represented in this plan.



APF 10		APF 25	
			
Filtering Facepiece	Half Mask (Elastomeric)	Loose-Fitting Powered Air-Purifying Respirator (PAPR)	Hooded Powered Air-Purifying Respirator (PAPR)


2. If a department wants to purchase a tool with dust controls that is not listed below, contact EHS so all literature can be reviewed to determine effectiveness of the dust controls.
3. Refer to the notes section at the end of the table for special reference explanations.


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. 	<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 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.


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>(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)</p> 	<p>For tasks performed <u>outdoors only</u>:</p> <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	<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 to prevent clogging; and ■ The dust collection bags are emptied to avoid overfilling.
<p>(iv) Walk-behind 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> <ul style="list-style-type: none"> ■ When used outdoors. ■ When used indoors or in an enclosed area. 	None APF 10	None APF 10	<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 to apply water at the point of dust generation; ■ The spray nozzles are not clogged or damaged; and ■ All hoses and connections are intact.


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>(v) Drivable saws</p> 	<p>For tasks performed <u>outdoors only</u>:</p> <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	<p>Water Controls:</p> <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.
<p>(vi) Rig-mounted core saws or drills</p> 	<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	<p>Water Controls:</p> <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.


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.


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.


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 style="text-align: center;">OR</p> <p>Operate from within an enclosed cab and use water for dust suppression on drill bit.</p>	None	None	<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.

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 style="text-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.

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 preseparator or filter-cleaning mechanism.</p>	<p>APF 10</p>	<p>APF 25</p>	<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.

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 halflane)</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.

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.

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>(xvii) Heavy equipment and utility vehicles used to abrade or fracture silicacontaining materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials**</p> 	<p>Operate equipment from within an enclosed cab.</p> <p>When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.</p>	<p>None</p> <p>None</p>	<p>None</p> <p>None</p>	<p>No additional information provided. Refer to the engineering and work practice control methods outlined.</p>


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>(xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: demolishing, abrading, or fracturing silica-containing materials</p> 	<p>Apply water and/or dust suppressants as necessary to minimize dust emissions.</p> <p style="text-align: center;">OR</p> <p>When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.</p>	None	None	<p>The following scenarios are examples of when the employer must use water and/or dust suppressants as necessary to minimize dust emissions:</p> <ul style="list-style-type: none"> ■ Equipment for grading and excavating is not equipped with enclosed, pressurized cabs. <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> ■ 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.

Table 1 References:

† 1. When implementing the control measures specified in Table 1, each employer shall:

- a. *For tasks performed using wet methods*, apply water at flow rates sufficient to minimize release of visible dust. The appropriate water flow rates for controlling silica dust emissions can vary; therefore, it is necessary to follow manufacturers’ instructions when determining the required flow rate for dust suppression systems on a given worksite. Integrated water systems must be developed specifically for the type of tool in use so they will apply water at the appropriate dust emission points based on tool configuration and do not interfere with other tool components or safety devices.

Any slurry generated when using water to suppress dust should be cleaned up to limit secondary exposure to silica dust when the slurry dries following procedures described in the employer’s *Written Exposure Control Plan*.

When working in cold temperatures, where there is a risk of water freezing, additional work practices such as insulating drums, wrapping drums with gutter heat tape, or adding environmentally-friendly antifreeze may be needed.

- b. *For tasks performed using commercially available, dust collection systems (i.e. LEV), use equipment that is designed to effectively capture dust generated by the tool being used and does not introduce new hazards such as obstructing or interfering with safety mechanisms. The “commercially available” limitation is meant only to eliminate on-site improvisations of equipment by the employer. When employers use methods other than commercially available systems for dust suppression, they must conduct exposure assessments and comply with the PEL.*

Some Table 1 entries for dust collection systems specify use of cyclonic pre-separators and filter cleaning mechanisms to prevent buildup of debris on filters that result in less dust capture. A cyclonic pre-separator collects large debris before the air reaches the filters. A filter cleaning mechanism prevents the need for manually cleaning filters to prevent buildup of debris (caking). Some vacuums are equipped with a gauge indicating filter pressure or an equivalent device (e.g., timer to periodically pulse the filter) to help employees in determining when it is time to run a filter cleaning cycle.

- c. *For tasks performed indoors or in enclosed areas, provide a means of exhaust as needed to minimize the accumulation of visible airborne dust. Indoors or in an enclosed area means areas where airborne dust can build up unless additional exhaust is used. Sufficient air circulation in enclosed or indoor environments is important to ensure the effectiveness of the control strategies and to prevent the accumulation of airborne dust. The means of exhaust necessary could include: the use of portable fans (box fans, floor fans, and axial fans), portable ventilation systems, or other systems that increase air movement and assist in the removal and dispersion of airborne dust. To be effective, the ventilation must be set up so that movements of employees during work, or the opening of doors and windows, will not negatively affect the airflow.*
- d. *For measures implemented that include an enclosed cab or booth, ensure that the enclosed cab or booth:*
 - i. Is maintained as free as practicable from settled dust;
 - ii. Has door seals and closing mechanisms that work properly;
 - iii. Has gaskets and seals that are in good condition and working properly;
 - iv. Is under positive pressure maintained through continuous delivery of fresh air;
 - v. Has intake air that is filtered through a filter that is 95% efficient in the 0.3-10.0 µm range (e.g., MERV-16 or better); and
 - vi. Has heating and cooling capabilities.

(2) Where an employee performs more than one task on Table 1 during the course of a shift, and the total duration of all tasks combined is more than four hours, the required respiratory protection for each task is the respiratory protection specified for more than four hours per shift. If the total duration of all tasks on Table 1 combined is less than four hours, the required respiratory protection for each task is the respiratory protection specified for less than four hours per shift.

* Refer to [OSHA's Small Entity Compliance Guide](#) for more information.

** When the operator exits the enclosed cab and is no longer actively performing the task, the operator is considered to have stopped the task. However, if other abrading, fracturing, or demolition work is performed by other heavy equipment and utility vehicles in the area while an operator is outside the cab, that operator is considered to be an employee “engaged in the task” and must be protected by the application of water and/or dust suppressants.

‡ 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.

§ The integrated water delivery system can be a free-flowing water system designed for blade cooling as well as manufacturers’ systems designed for dust suppression alone. This option applies only when grinders are used outdoors.

†† The water spray systems can be installed so that they can be activated by remote control.