THE OHIO STATE UNIVERSITY

Silica Dust

Safety Program

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1. Introduction

It is the policy of The Ohio State University (Ohio State) to take precautions to eliminate potential hazards in the workplace. The purpose of the university's Silica Dust Safety Program is to identify the hazards associated with respirable silica dust and outline the steps to take to ensure employees who work with, or around silica are not exposed to hazardous levels of silica dust. Additionally, this program is to provide procedures for common silica related work duties to minimize exposure in accordance with the Occupational Safety and Health Administration (OSHA) standards 29 CFR 1910.1053(l) for general industry and maritime, 29 CFR 1926.1153(k) for construction and 29 CFR 1910.1000 Air Contaminants.

Crystalline silica is a basic component of soil, sand, granite, and many other minerals. Quartz is the most common form of crystalline silica. All materials containing silica can result in the presence of respirable silica particles when chipping, cutting, drilling, or grinding takes place. Silica exposure occurs through inhalation of silica containing particles and may occur through construction and general industry activities. The most severe exposures generally occur during abrasive blasting with sand to remove paint and rust from bridges, tanks, concrete structures, and other surfaces. Other activities that may result in silica exposure include jack hammering, rock/well drilling, concrete mixing, concrete drilling, brick and concrete cutting/sawing, tuck pointing and tunneling operations. Exposure to excessive silica dust over long periods of time can result in adverse health effects such as silicosis.

This Silica Dust Safety Program applies to Ohio State employees who are expected to be exposed to silica dust through the methods outlined above; or through other means, which are determined by Environmental Health and Safety (EHS) or their supervisor.

2. Responsibilities

Environmental Health and Safety

Environmental Health & Safety (EHS) provides program oversight and consultation to Ohio State work groups regarding potential risks, exposure prevention and training relating to silica dust exposures. Additional EHS responsibilities include:

- Conducting building/material assessments for silica containing materials and perform employee silica hazard assessments/monitoring upon request.
- Assisting department supervisors with creating an exposure control plan.
- Reviewing this program annually.

Ohio State Departments

Each department with responsibilities for maintaining buildings or working in buildings with potential exposure to silica must:

- Ensure the applicable components of the Silica Dust Safety Program are available to all affected employees.
- Provide applicable training to employees expected to work in, or with, building materials where there is a potential risk for silica exposure.
- Provide appropriate equipment to comply with the OSHA standard.
- Coordinate with EHS to schedule exposure monitoring.
- Enforce work practices and personal protective equipment (PPE) requirements.

- Develop housekeeping procedures.

Supervisors

Ohio State employees who supervise personnel with responsibilities to work in areas where there is a risk of exposure to silica dust, must ensure employees are:

- Properly trained on the applicable contents of the Silica Dust Safety Program.
- Provided appropriate engineering controls and equipment.
- Provided administrative controls when engineering controls are not practical.
- Provided personal protective equipment (PPE) when engineering controls and administrative controls cannot be implemented.

Authorized Person

Employees working in areas where there is an identified risk of silica dust exposure must be properly trained on all applicable elements of the Ohio State Silica Dust Safety Program. They must be provided, and utilize, the appropriate tools, equipment, and PPE for the task being performed. Additional responsibilities include:

- Participating in exposure monitoring.
- Using work practices consistent with OSHA Table 1 (see Appendix A).
- Restricting access to the hazardous work area.

3. Definitions

The following definitions are provided to allow for a better understanding of the Silica Dust Safety Program.

Action level – A concentration of airborne respirable crystalline silica of 25 µg/m3 , calculated as an 8-hour TWA.

Authorized person – An employee who has received proper training and exposure monitoring to safely work with silica containing materials.

Crystalline silica – Naturally occurring component in earth soils, sand, granite and many other minerals resulting in many building materials containing silica.

Exposure assessment – The initial determination to find if any employee may be exposed to lead at or above the permissible exposure level. Until the assessment is completed, employees shall take all precautions necessary to maintain exposures below the PEL.

High Efficiency Particulate Air (HEPA) – A filtering system capable of trapping and retaining at least 99.97% of all particles of 0.3 micron in diameter and larger.

Permissible Exposure Limit (PEL) – The OSHA limit for silica dust exposure. It is set at 50µg/m^3, averaged over an 8-hour workday, as a TWA.

Silica containing material – Any material, which has the potential to contain silica at levels, which may pose a hazard to employees when the material is manipulated to create airborne particles

Silicosis – A lung disease caused by inhalation of silica dust. Silica dust can cause fluid buildup and scar tissue in the lungs that cuts down the ability for the lungs to fully function. The disease is not curable, but can be prevented through the use of protective systems.

4. Material Assessment

Any time there is a potential for silica containing materials to be involved in a project, sources of silica must be assessed prior to disturbing. EHS or an authorized contractor can perform building material assessments to determine silica content in materials.

Crystalline silica occurs naturally in the earth's crust and is a basic component of sand, concrete, brick, asphalt, granite, some blasting grit and wall spackling materials. Employees can be exposed to silica when conducting activities such as:

- Abrasive blasting
- Jack hammering
- Concrete crushing
- Hoe ramming
- Rock drilling
- Mixing of concrete or grout
- Concrete drilling
- Sawing concrete or bricks
- Chipping or scarifying concrete
- Rock crushing
- Moving or dumping piles of concrete, rock, or sand
- Demolition of concrete or brick
- Using coatings containing silica
- Removing coatings containing silica

If airborne silica is expected to be generated during the project, EHS shall be contacted to conduct exposure monitoring and ensure all safety precautions are followed to minimize exposure to airborne silica dust.

5. Exposure Monitoring

Initial Exposure Monitoring

Ohio State employees that are reasonably expected to come in contact/work with silica containing materials where there is a risk of exposure through inhalation of dust should develop an exposure monitoring program.

Initial exposure monitoring should be conducted by OSU EHS to quantitatively evaluate the exposure to airborne silica. Exposure monitoring should be conducted on any employee exposed to airborne silica dust as levels may vary based on job duty within a project. For example, the employee performing concrete cutting vs an employee providing supervision during the work.

If initial monitoring indicates employee exposures are below the action level (25µg/m3), the monitoring may be discontinued. Where monitoring indicates any level of silica exposure are at or above the action level but below the PEL, periodic exposure monitoring must be repeated within six months of the most

recent monitoring. Where monitoring indicates any level of silica exposure above the PEL, exposure monitoring must be repeated within three months of the most recent monitoring.

Periodic Exposure Monitoring

Whenever silica exposure levels are greater than the action level (25 µg/m^3), periodic exposure monitoring is required. It is the responsibility of the affected department to work with EHS and develop a periodic exposure-monitoring schedule.

Action level means a concentration of airborne respirable crystalline silica of 25 µg/m3, calculated as an 8-hour TWA. The frequency of exposure monitoring should be as follows:

Measured Concentration	**Monitoring Frequency**
Above the action level and less than PEL (25 – 50 µg/m^3)	Every 6 months
Above the PEL (>50 µg/m^3)	Every 3 months

Departments must work in conjunction with EHS to reassess exposures whenever a change in the process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the action level, or when there is any reason to believe that new or additional exposures could be at or above the action level.

Termination of Exposure Monitoring

Periodic exposure monitoring may be discontinued if results from two consecutive sampling periods taken at least 7 days apart show that employee exposure is below the action level.

Sampling methods

Personal exposure monitoring will be conducted using an approved NIOSH method. Monitoring records shall include the following:

The date, number, duration, location and results of each of the samples taken, including a description of the sampling procedure used to determine representative employee exposure where applicable.

- A description of the sampling and analytical methods used.
- The type of respiratory protective devices, if any.
- Name and job classification of the employee monitored.
- Any environmental variables that could affect the measurement of the employee exposure.

Reporting of exposure monitoring results

EHS will notify the department/supervisor of exposure monitoring results as soon as the final laboratory analysis is completed. The department/supervisor must provide this information to the affected employee(s) within 15 working days.

If, during the exposure monitoring, levels are measured which exceed the PEL, the EHS report will include steps and controls to reduce exposure to below the PEL.

Follow up exposure monitoring may be necessary if engineering or administrative controls are put in place to reduce hazardous exposures.

6. Exposure Control

Written Exposure Control Plan

Supervisors may consult with EHS to develop and implement a written exposure control plan. The exposure control plan shall include a description of the:

- Workplace that involves exposure to respirable crystalline silica.
- Engineering controls, work practices, and respiratory protection used to limit employee exposure to respirable crystalline silica for each task.
- Housekeeping measures used to limit employee exposure to respirable crystalline silica.
- Procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to respirable crystalline silica and their level of exposure.

Pre-project planning

Prior to projects taking place affecting Ohio State buildings/facilities, EHS reviews planning documents to account for potential exposures to hazardous materials, including silica. EHS can conduct building material assessments to make determinations if there are any silica containing materials which may be impacted by the project. Any silica containing materials are addressed and methods for exposure control are provided by EHS prior to work beginning. If silica containing materials are to be disturbed during the project, the appropriate exposure control methods will be recommended by EHS.

Administrative/Engineering Controls

Where silica exposures at or above the PEL have been documented, or are expected, the appropriate engineering or administrative controls will be implemented, where feasible. Follow-up exposure monitoring may be necessary when administrative or engineering exposure controls are utilized. Refer to Appendix A for additional information. Typical controls may involve:

- Substituting non-silica containing materials for use while abrasive blasting
- Alternative methods such as pre ordering grout already mixed instead of on- site mixing in bulk
- Local exhaust ventilation
- General ventilation
- Limit worker access to high exposure areas
- Vacuum methods with HEPA filters
- Distance
- Dust control products
- Containment
- Use of water to keep dust down
- General work practices such as good housekeeping, , development of specific SOPs to minimize exposure

Personal Protective Equipment (PPE)

In addition to administrative/engineering controls, employees may be required to wear specific PPE during the disturbance of silica containing materials and/or when airborne silica is present. The level of

protection will depend on the task being conducted and the tools being utilized to complete the task. Recommended PPE will typically include:

- Respiratory Protection
- Disposable or reusable work clothing
- Leather gloves
- Safety glasses or goggles
- Face shield
- Boot covers or rubber boots

Respiratory Protection: Additional Information

Respiratory Protection is required under any of the following circumstances:

- Where exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls.
- Where exposures exceed the PEL during tasks, such as certain maintenance and repair tasks, for which engineering and work practice controls are not feasible.
- During tasks for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposure to or below the PEL.
- During periods when the employee is in a regulated area.
- Employees utilizing a respirator must adhere to the policies outlined in the Ohio State Respiratory Protection Program.

The following table provides recommended respiratory protection levels based on the measured or anticipated exposure levels:

Respirator	Protection Factor	Typical Silica Activity
N95	Less than 50 µg/m^3	- Used on voluntary basis to control low exposures
Half-face with HEPA filters	50 – 500 µg/m^3	- Housekeeping (wet method) - Saw cutting (wet method) - Drilling concrete (wet method) - Power tools with dust collection - Equipment operating with open cab
Full-face with HEPA filters	500 – 5,000 µg/m^3	- Chipping concrete - Jack Hammering - Power tools without dust collection - Mixing grout in bulk - Vacuum abrasive blasting
SCBA	Above 5,000 µg/m^3	- Abrasive blasting

7. Housekeeping and Hygiene Facilities

In areas where silica containing dust may be present, all surfaces must be maintained free from accumulations of dust to minimize potential silica exposure. Dust and other silica containing debris must be removed from the work area as soon as possible.

Acceptable method of silica dust removal includes the use of HEPA vacuum or wet methods such as wet mopping. Unacceptable methods of silica dust removal include dry sweeping, dry brushing ,vacuum cleaners, shop vacuums, and compressed air. Employees must follow all recommended procedures and utilize recommended PPE during silica containing debris cleanup activities. Where silica containing materials are used, impacted, or being removed; the following requirements must be met:

- PPE should be removed upon work completion and disposed of after each use.
- Employees must wash hands and are recommended to shower prior to leaving work.
- Contaminated PPE, including footwear is not worn outside the work areas.

8. Medical Surveillance

Employees exposed to silica levels at or above the Permissible Exposure Limit action level (25 µg/m^3) for 30 days or more per year, or any employee working with silica who develops signs/symptoms of excessive exposure, should be enrolled in the Medical Surveillance Program.

All medical surveillance will be performed by Ohio State Employee Health Services and results must be provided the affected employee and their supervisor within 15 days of the assessment. The medical surveillance program consists of medical and work history, baseline and annual examination and chest X-ray.

Employees enrolled in the medical surveillance program should be examined annually to track any changes as a result to exposure to silica dust.

9. Training and Recordkeeping

Silica Awareness Training

Silica awareness training must be offered to affected employees prior to working with silica and annually thereafter. The training is available in person or can be found on the EHS website: https://ehs.osu.edu/occupational-health-and-safety-training.

Silica awareness training should include the following:

- Information about the potential health effects and symptoms of exposure to respirable silica
- Safety data sheets for silica, quartz, and applicable products containing silica
- Specific tasks in the workplace that could result in exposure to respirable silica
- The purpose and set up of regulated areas to mark the boundaries of work areas containing silica dust
- The specific use of engineering controls, work practices, good housekeeping and PPE to control exposure to silica
- Use and care of PPE
- Expected exposures to silica dust
- Exposure monitoring process
- Medical surveillance program
- Identification of competent person

The supervisor is required to maintain all training, medical surveillance, and exposure monitoring results.

Hazard Communication

Hazard Communication training is required by all Ohio State employees and should be conducted initially upon hiring. This training contains information regarding safety data sheets (SDSs). Safety data sheets can be referenced for hazardous materials and can alert to users of the material to the presence of silica dust.

Respiratory Protection

Respiratory protection training, medical clearance, and quantitative fit testing is required under the Respiratory Protection Program. Contact EHS for additional information regarding enrollment in the program.

10. Signage

Supervisors must establish regulated areas wherever employee exposure to silica is expected to exceed the PEL.

Regulated areas must be demarcated from the rest of the workplace in a manner to minimize the number of employees exposed to silica.

In regulated areas where exposure to silica dust may exceed the PEL the following type of signage must be in place to warn employee of hazards.

Access to regulated areas is permitted only be employees required to perform work in the area; personnel conducting exposure monitoring; or other personnel as approved by supervisors and EHS.

Appendix A – OSHA 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)	
		≤ 4 hours/shift	>4 hours/shift
(i) Stationary masonry 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	None	None
(ii) Handheld power saws (any blade diameter)	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:		
	-When used outdoors	None	APF 10
	-When used indoors or in an enclosed area	APF 10	APF 10
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)	For tasks performed outdoors only: 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
(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:		
	-When used outdoors	None	None
	-When used indoors or in an enclosed area	APF 10	APF 10
(v) Drivable saws	For tasks performed outdoors only:		

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
	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
(vi) Rig-mounted core saws or drills	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
(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills)	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
(viii) Dowel drilling rigs for concrete	For tasks performed outdoors only:		
	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	APF 10	APF 10
(ix) Vehicle-mounted drilling rigs for rock and concrete	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	None	None
	OR		
	Operate from within an enclosed cab and use water for dust suppression on drill bit	None	None
(x) Jackhammers and handheld powered chipping tools	Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact:		
	-When used outdoors	None	APF 10

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	**>4 hours/shift**
	-When used indoors or in an enclosed area	APF 10	APF 10
	OR		
	Use tool equipped with commercially available shroud and 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:		
	-When used outdoors	None	APF 10
	-When used indoors or in an enclosed area	APF 10	APF 10
(xi) Handheld grinders for mortar removal (*i.e.*, tuckpointing)	Use grinder equipped with commercially available shroud and dust collection system	APF 10	APF 25
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	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		
(xii) Handheld grinders for uses other than mortar removal	For tasks performed outdoors only: Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	OR		
	Use grinder equipped with commercially available shroud and dust collection system		
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust		

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
	emissions		
	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:		
	-When used outdoors	None	None
	-When used indoors or in an enclosed area	None	APF 10
(xiii) Walk-behind milling machines and floor grinders	Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	OR		
	Use machine equipped with dust collection system recommended by the manufacturer	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	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		
	When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes		
(xiv) Small drivable milling machines (less than half-lane)	Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant	None	None
	Operate and maintain machine to minimize dust emissions		
(xv) Large drivable milling machines (half-lane and larger)	For cuts of any depth on asphalt only: Use machine equipped with exhaust ventilation on drum enclosure and supplemental water	None	None

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
	sprays designed to suppress dust		
	Operate and maintain machine to minimize dust emissions		
	For cuts of four inches in depth or less on any substrate:		
	Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust	None	None
	Operate and maintain machine to minimize dust emissions		
	OR		
	Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant	None	None
	Operate and maintain machine to minimize dust emissions		
(xvi) Crushing machines	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)	None	None
	Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions		
	Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station		
(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	None	None
	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
(xviii) Heavy equipment and utility vehicles for tasks such as grading and	Apply water and/or dust suppressants as necessary to minimize dust emissions	None	None

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
excavating but not including: Demolishing, abrading, or fracturing silica-containing materials	OR		
	When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab	None	None