Silica Management Program

DARTMOUTH

EHS Approved BY:	*Annette Chism, Sr.Director*	Revision date:	
Original Program Date:	11/19/2025	Revision #	

Table of Contents

Section 1 – Introduction 3

Section 2 – Purpose 3

Section 3 – Scope 3

Section 4 – Definitions 3

Section 5 – Roles and Responsibilities 5

5.1 Environmental Health and Safety (EHS) 5

5.3 Employees 6

5.4 Occupational Medicine 7

5.5 External Contractors Completing Work at Dartmouth Properties 7

Section 6 –Program Requirements 7

6.1 Exposure Assessment / Monitoring 7

6.1.1 Initial Exposure Assessment 7

6.1.2 Periodic Exposure Assessment 7

6.1.3 Reassessment of Exposure 7

6.1.4 Sampling Methods 8

6.1.5 Reporting of exposure monitoring results 8

6.2 Regulated Areas 8

6.3 Exposure Control Plan 8

6.4 Engineering, Administrative, and Work Practice Controls 8

6.4.1 Personal Protective Equipment (PPE) 9

6.4.2 Housekeeping 10

6.4.3 Medical Surveillance 10

6.4.4 Hazard Communication 11

Section 7 – Recordkeeping 11

Section 8 – Training 11

Section 9 –Program Evaluation 12

Appendix A: Written Exposure Control Plan 13

Appendix B: OSHA 29 CFR 1926.1153 Table 1 14

Appendix C: Danger Sign for Posting in Regulated Areas 21

EHS Approved BY:	*Annette Chism, Sr.Director*	Revision date:	
Original Program Date:	11/19/2025	Revision #	

Section 1 – Introduction

Respirable crystalline silica (RCS) is a common mineral found in many naturally occurring and human-caused materials used in building and hardscape construction. Respirable-sized particles are generated during high-energy operations like sawing, cutting, grinding, drilling, excavating, and crushing silica-containing materials or when abrasive blasting with silica-containing materials or on substrates that contain silica. RCS exposure at elevated levels can lead to health effects such as silicosis, lung cancer, and kidney disease.

Section 2 – Purpose

The Respirable Crystalline Silica Program (Program) and exposure control plan have been developed to protect the health and safety of Dartmouth College employees, building occupants, visitors, and contractors from potential exposure to crystalline silica. This Program and exposure control plan were developed in accordance with OSHA's regulations governing respirable crystalline silica in construction work, 29 CFR 1926.1153, and OSHA's general regulations governing exposure to respirable silica, 29 CFR 1910.1053

Questions regarding this Program should be directed to Environmental Health and Safety 603-646-1762 or ehs@dartmouth.edu.

Section 3 – Scope

This Program applies to all faculty, staff, student employees, and contractors of Dartmouth College who may be exposed to RCS. This program covers employees who work with silica, establishes the minimum requirements for working with silica, and applies to those who are exposed over the action level.

A copy of this program is available on the EHS (Environmental Health and Safety) website and, upon request, will be available to all employees enrolled in the Program.

Section 4 – Definitions

Action Level - an airborne concentration of 25 µg/m^3 calculated as an 8-hour TWA for respirable crystalline silica. Exposures at or above the action level trigger requirements for exposure assessment.

Administrative Controls (or Work Practices) - changes in work procedures such as written safety policies, rules, supervision, schedules, and training with the goal of reducing the duration, frequency, and severity of exposure to hazardous chemicals or situations.

Aerodynamic diameter – the diameter of a sphere of the same particle density having the

same terminal velocity in air or some other relevant fluid.

Assigned Protection Factor (APF) - workplace level of respiratory protection that a respirator is expected to provide to employees.

Carcinogen – a substance capable of causing cancer in living tissue.

Competent Person: individual capable of identifying existing and foreseeable respirable crystalline silica hazards in the workplace and authorized to take prompt corrective measures to eliminate or minimize them. The competent person must have the knowledge and ability necessary to implement the written exposure control plan required under the standard. The competent person must "make frequent and regular inspections of job sites, materials, and equipment to implement the written exposure control plan."

Dust Collection System - use of a shroud or cowling around the tool bit or cutting zone that works with a vacuum to collect respirable crystalline silica as it is produced during cutting operations.

Engineering Controls - to eliminate or reduce exposure to a chemical or physical hazard through the use or substitution of engineered machinery or equipment.

Exposure Assessment/Monitoring - initial determination to find if any employee may be exposed to respirable crystalline silica or above the permissible exposure level. Until the assessment is completed, employees shall take all precautions necessary to maintain exposures below the PEL.

Fully and Properly Implemented - controls are in place, are properly operated and maintained, and employees understand how to use them.

High-Efficiency Particulate Air (HEPA) Filter – a filter that is at least 99.97 percent efficient in removing monodispersed particles of 0.3 micrometers in diameter. A P100 or N100 cartridge meets the definition of HEPA.

Objective Data - information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to silica associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions closely resembling, or with a higher exposure potential than, the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

OSHA – Occupational Safety and Health Administration

Permissible Exposure Limit (PEL) - set by OSHA, is the maximum airborne concentration an employee can be exposed to – 50 $\mu g/m^3$ averaged over 8-hour work shift of a 40-hour work week. PELs (Permissible Exposure Limit) are regulatory limits that are legally enforceable.

Personal Protective Equipment (PPE) - protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter.

Physician or Other Licensed Health Care Professional (PLHCP) - an individual whose

legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all the healthcare services required by this standard.

Respirators (Full, Half-Face or N, P or R 100) **-** a tight-fitting, air-purifying respirator with replaceable filters (for particulates), cartridges, or canisters (for gases and vapors). In either case, these are attached to a rubber or silicone face piece that covers the nose and mouth and/or full face. This type of respirator requires the individual to be part of a respiratory protection program and needs to be fit tested annually and can be used instead of a filtering face piece respirator.

Respirable Crystalline Silica - quartz, cristobalite, and/or tridymite contained in airborne particles that are determined to be respirable by a sampling device designed to meet the characteristics for respirable-particle-size-selective samplers specified in the International Organization for Standardization (ISO) 7708:1995: Air Quality—Particle Size Fraction Definitions for Health-Related Sampling.

Silica - a hard, unreactive, colorless compound that occurs as the mineral quartz and as a principal constituent of sandstone and other rocks.

Silicosis - lung fibrosis caused by the inhalation of dust containing silica.

Time Weighted Average (TWA) - an average exposure over a specified period, usually a nominal eight hours.

Water Delivery System- an integrated system that continuously delivers water to the saw blade.

Section 5 – Roles and Responsibilities

5.1 Environmental Health and Safety (EHS)

- Develop and maintain the Dartmouth College Respirable Crystalline Silica Program.
- Annually review the Program.
- Develop, conduct, and/or provide through third-party Silica Awareness Training.
- Maintain training records associated with the Program.
- Provide Program oversight and consultation.
- Coordinate with contract Industrial Hygienist or consultant for quantitative and qualitative assessments of employee exposure to respirable crystalline silica.
    - Exercise surveillance over health and safety issues regarding testing and monitoring.
    - In coordination with the employees' department, provide affected employees notification within five working days of receiving laboratory analysis results.
- In coordination with the employee or contractor working around silica, make engineering, administrative, and personal protective equipment recommendations.
- Recommend and/or require corrective measures to eliminate or reduce the

potential exposure to respirable crystalline silica.

- Coordinate with competent person to verify frequent and regular inspections are occurring at the jobsite, materials, and equipment, and for implementation of the written exposure control plan.
- Conduct periodic site inspections and identify respirable crystalline silica hazards.
- Conduct periodic audits.

5.2 Deans, Directors, Department Heads, Principal Investigators, and Supervisors

Have primary responsibility for the management and enforcement of the Dartmouth Respirable Crystalline Silica Program in their areas. Those departments performing construction, renovation, maintenance, or repair work covered by this Program shall:

- Designate an on-site competent person to regularly inspect job sites, materials, and equipment to implement the written exposure control plan.
- Confirm that employees and those working near RCS are trained in the Respirable Crystalline Silica Program's applicable contents and provided with appropriate personal protective equipment (PPE) when conducting such work.
- Actively support and implement this Program as part of the work unit's overall safety effort.
- Notify EHS in cases of uncontrolled releases of visible dust in occupied buildings.
- Coordinate with EHS to schedule required exposure monitoring.
- Inform EHS when processes, equipment, or other variables that may affect exposure to respirable crystalline silica have changed.
- Enforce PPE and work practice requirements.
- Develop procedures restricting access to the work environment(s) where the production of respirable crystalline silica is probable based on work tasks performed.
- Develop procedures for housekeeping that comply with the housekeeping section of the Program.
- Maintain and record exposure control plans.

5.3 Employees

- Working in areas where there is an identified risk of respirable crystalline silica exposure must be trained on all applicable elements of the Respirable Crystalline Silica Program; and be provided and utilize the appropriate PPE /equipment for the task being performed.
- Participate in exposure monitoring when quantitative measurements are required.
- Assist EHS with answering questions related to the tasks being performed during assessments.
- Adhere to work practices outlined in Specified Exposure Control Methods and department-specific standard operating procedures (SOP).
- Restrict access to the work area where respirable crystalline silica is produced to minimize the number of persons exposed to respirable crystalline silica.

- Comply with these procedures and any further safety requirements.

5.4 Occupational Medicine

- Provide medical surveillance to employees who have been identified for respirable crystalline silica exposures.

5.5 External Contractors Completing Work at Dartmouth Properties

- Contractors who may engage in work that creates respirable crystalline silica will include silica control plans as part of their site-specific plan.

Section 6 – Program Requirements

This section was developed in accordance with the requirements of 29 CFR 1910.1053 and 29 CFR 1926.1153 applicable to the college; and in addition to the Program Requirements, the college will comply with the requirements of federal law.

6.1 Exposure Assessment/Monitoring

6.1.1 Initial Exposure Assessment

- Exposure monitoring will be conducted on any employee who is or may be expected to be exposed to respirable crystalline silica at or above the Action Level (AL) of 25 micrograms of silica per cubic meter of air ($\mu g/m^3$).
- Exposure monitoring to assess 8-hour time-weighted average (TWA) exposure for each employee based on one or more personal breathing zone air samples reflecting the exposures of each shift, job classification, and work area. When several employees perform the same tasks on the same shift and in the same work area, EHS may sample a representative fraction of these employees. Employees expected to have the highest exposure to respirable crystalline silica will be monitored during representative sampling.
- Exposure monitoring is not required if the task is listed in 29 CFR 1926.1153(c)(1) and the engineering controls, work practices, and PPE listed are used as listed. (See Appendix B.)

6.1.2 Periodic Exposure Assessment

- If the most recent results are at or above the AL, 25 $\mu g/m^3$, but are below the PEL, 50 $\mu g/m^3$, monitoring shall be repeated within 6 months of the most recent sampling.
- If the most recent results are at or above the PEL, 50 $\mu g/m^3$, monitoring shall be repeated within 3 months of the most recent sampling.
- 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, 25 $\mu g/m^3$.

6.1.3 Reassessment of Exposure

- Dartmouth EHS shall reassess exposure(s) whenever there is a change in the production, 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 or when Dartmouth EHS has any reason to believe that new or additional exposures at or above the action level have occurred.

6.1.4 Sampling Methods

- Personal exposure monitoring will be conducted using samplers shown to conform closely with the ISO 7708/CEN convention (Document ID 1834, Attachment 1). ISO 7708/CEN permits employers to use any sampling device that conforms to the ISO 7708/CEN convention. These include various cyclones (Dorr-Oliver, Higgins-Dewell, and SKC aluminum), and parallel particle impactors (PPIs). When these devices are used at appropriate flow rates, they can collect a quantity of respirable crystalline silica that exceeds the quantitative detection limit for quartz (the principal form of crystalline silica) of 10 µg for OSHA's XRD method. The X-ray diffraction method for determining silica content is the industry standard and the most accurate.
- EHS, in coordination with an industrial hygienist, shall follow the methods outlined in OSHA's Occupational Exposure to Respirable Crystalline Final Rule.
- Samples will be sent to an accredited laboratory and analyzed using applicable and validated measurement techniques for respirable crystalline silica, such as x-ray diffraction, infrared, visible absorption spectrophotometry, gravimetric, and/or a combination of one or more.

6.1.5 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 five working days.
- If levels are measured during the exposure monitoring exceeding 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.

6.2 Regulated Areas

- Anywhere the exposure level is, or can reasonably be expected to be above the PEL, a regulated area will be established. The regulated area must be separated from other areas in a way to minimize the number of employees exposed. At each entrance of a regulated area, the sign in Appendix C must be posted.
- Only employees and other persons authorized by EHS and required by work duties to be present in the regulated area can enter. All employees entering the regulated area must wear a respirator, regardless of the time spent there.

6.3 Exposure Control Plan

- A written exposure control plan must be developed for each area with an exposure over the AL, 25 µg/m^3. Appendix A provides an exposure control plan template.

6.4 Engineering, Administrative, and Work Practice Controls

Where respirable crystalline 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 utilizing administrative or engineering exposure controls. Whenever feasible engineering, work practice, and administrative controls do not reduce employee exposure at or below the PEL, Dartmouth will continue to use them to reduce employee exposure to the lowest feasible concentration and supplement with respiratory protection. Utilize Table 1 in Appendix B for guidance.

Typical safe work practices may involve, but are not limited to:

- All engineering controls function properly before commencing operations.
- Implement wet methods that involve the application of water to dust areas.
- Deploy local exhaust ventilation in dust work environments.
- Utilize enclosures, if accessible, to segregate work processes.
- Explore the option of combining water and ventilation controls.
- Regularly replace water and air filters as needed or according to manufacturer's instructions.
- Refrain from dry sweeping or using compressed air during housekeeping procedures.
- When dust controls and safe work practices cannot sufficiently limit exposure below the OSHA PEL, use respiratory protection.
- Participate in medical surveillance when respirable crystalline silica concentrations exceed acceptable exposure limits.
- General work practices such as good housekeeping, worker rotation, and development of specific SOPs (Standard Operating Procedure) to minimize exposure.

For tasks not listed in Table 1, or where engineering controls, work practices, and respiratory protection are not fully or properly implemented, Dartmouth shall safeguard employee exposure to an airborne concentration of respirable crystalline silica not exceeding 50 $\mu g/m^3$, calculated as an 8-hour TWA.

6.4.1 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. If needed, a competent person on-site, with the assistance of EHS, will determine the appropriate PPE for the task.

Recommended PPE will typically include:

- Disposable or reusable work clothing to keep from spreading the dust or bringing the dust home.

- Leather gloves
- Safety glasses or goggles
- Face shield
- Boot covers or rubber boots.

Dartmouth EHS will provide an appropriate respirator that complies with Dartmouth's Respiratory Protection Program only if one or more of the following conditions are met:

- Where specified by Table 1 in 29 CFR 1926.1153; or
- For tasks not listed in Table 1 in 29 CFR 1926.1153.
- Exposure(s) exceed the PEL during periods of necessary installation/implementation of feasible engineering and work practice controls.
- Exposure(s) exceed the PEL during maintenance and repair tasks for which engineering and work practice controls are not feasible.
- During periods when an employee is in a regulated area.
- All feasible engineering and work practice controls are insufficient to reduce exposures at or below the PEL.

6.4.2 Housekeeping

- Individual departments will follow their established housekeeping procedures.
- Respirable crystalline silica will be cleaned with wet sweeping methods or HEPA-filtered vacuum cleaners. These methods will minimize the likelihood of exposure.
- Unacceptable respirable crystalline silica removal methods include dry sweeping, vacuum cleaners, shop vacuums, and use of compressed air, whether for use to clean clothing or surfaces.
- Follow all recommended procedures and utilize recommended PPE during silica-containing debris cleanup activities.
  - Non-reusable/non-cleanable PPE will be disposed of after each use.
  - Wash your hands and shower if needed.
  - Contaminated PPE must not be worn outside of the work area.

6.4.3 Medical Surveillance

- Any employee exposed above the action level for 30 or more days per year will be provided medical surveillance at no cost. Medical surveillance is performed initially and at least every 3 years unless more frequently recommended by a physician or other licensed health-care professional (PLHCP).
- The medical examination may include medical and work history, a physical exam, chest x-ray, pulmonary function, tuberculosis test, and any other test recommended by the PLHCP.
- The employee's department will provide the following information to the PLHCP:
  - Employee's duties as they relate to silica exposure.
  - Results of exposure air sampling.
  - PPE used by employees.
  - Any medical examination records previously provided to the employee.
- A written report from the PLHCP on the results will be provided to the employee

within 30 days which includes:

- A statement indicating the medical examination results, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to respirable crystalline silica and any medical conditions that require further evaluation or treatment.
- Any recommended limitations on the employee' use of respirators.
- A statement that the employee should be examined by a specialist if referral to a specialist is otherwise deemed appropriate by the PLHCP.

- A written report of the PLHCP's medical opinion provided to Dartmouth within 30 days which includes:
  - Date of examination.
  - Statement that the examination has met the requirements of section 1926.1153(h) and 1910.1053(i).
  - Any recommended limitations on the employee's use of respirators.
  - If the employee provides written authorization, the PLHCP's written opinion shall also contain either or both of the following**:**
    - Any recommended limitations on the employee's exposure to respirable crystalline silica.
    - A statement that the employee should be examined by a specialist if the chest X-ray provided is classified as 1/0 or higher or referral to a specialist is otherwise deemed appropriate by the PLHCP.
- Dartmouth shall provide each employee with a copy of the written medical opinion within 30 days of each medical examination performed.

6.4.4 Hazard Communication

- Silica is identified in the Dartmouth College Hazard Communication Program. This includes proper labeling, Safety Data Sheets (SDS), signage, and training in accordance with the requirements of 29 CFR 1910.1053(j).

Section 7 – Recordkeeping

EHS will maintain records in accordance with 29 CFR 1910.1053 and 29 CFR 1926.1153, including air monitoring data, objective data, and medical surveillance data. Required records will be maintained and made available per 29 CFR 1910.1020, which requires employers to maintain these records for at least 30 years.

Section 8 – Training

- Identified Dartmouth employees will complete the online course for Respirable Crystalline Silica Safety, which provides general silica safety training, and site-specific training provided by the department must also be completed.
- The online training course will include the health hazards of silica, how to control silica exposure and the contents of the OSHA silica standards (1910.1053 and 1926.1153). The site-specific training will cover the information in Appendix A of

this Program includes the tasks that lead to silica exposure and specific methods used to lower the exposure.
- Employees exposed to silica above the action level must complete a silica safety training course annually.
- Online training records are maintained in the online program.

Section 9 – Program Evaluation

This Program will undergo an annual review and evaluation by EHS unless changes in operations, the OSHA Construction and General Industry Standard for Respirable Crystalline Silica Standards (29 CFR 1926.1153 and 29 CFR 1910.1053, respectively), or other relevant OSHA standards necessitate an immediate re-validation of this Program.

Appendix A: Written Exposure Control Plan

Description of Tasks and location:

Engineering Controls:

Work Practices:

Respiratory Protection:

Housekeeping Procedures:

Additional information:

Appendix B: OSHA 29 CFR 1926.1153 Table 1

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		

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
	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: 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:		

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
	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
	Use a HEPA-filtered vacuum when cleaning holes		
(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
	-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		

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
	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 emissions		

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
(xii) Handheld grinders for uses other than mortar removal	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	Use a machine equipped with	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
(less than half-lane)	supplemental water sprays designed to suppress dust. Water must be combined with a surfactant		
	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 sprays designed to suppress dust	None	None
	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

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

Appendix C: Danger Sign for Posting in Regulated Areas

RESPIRABLE CRYSTALLINE SILICA

MAY CAUSE CANCER

CAUSES DAMAGE TO LUNGS

WEAR RESPIRATORY PROTECTION IN THIS AREA

AUTHORIZED PERSONNEL ONLY