



University of Minnesota
Respirable Crystalline Silica
Exposure Control Plan

Effective September, 2017

Purpose

The University of Minnesota (the University) has implemented this plan to protect employees from the hazards of Respirable Crystalline Silica. The primary goal of this plan is to minimize and when feasible, prevent exposures to Respirable Crystalline Silica through the prudent and judicious use of accepted engineering controls, work-practice controls, Personal Protective Equipment and employee training.

Scope and application

This plan applies whenever any University employee is exposed to Respirable Crystalline Silica from any source, regardless of how/where their exposures are created.

This plan does not apply to the processing of sorptive clays.

This plan also does not apply when there is objective data (see “Definitions”) showing that an employee’s exposure to crystalline silica will remain below the Action Level under any foreseeable conditions.

Definitions

Action Level (AL). A concentration of airborne respirable crystalline silica of $25 \mu\text{m}/\text{m}^3$, calculated as an 8-hour Time-Weighted Average (TWA).

Assigned Protection Factor (APF). The workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified by this section.

Competent person. An individual who is capable of identifying existing and foreseeable respirable crystalline silica hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them. The competent person must have the knowledge and ability necessary to fulfill the responsibilities set forth in this plan.

Construction. Construction includes remodeling, alteration, maintenance and/or repair of buildings or structures including pavement, sidewalks, etc.

High Efficiency Particulate Air (HEPA). A filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

Minimum Efficiency Reporting Value (MERV). A measurement scale to rate the effectiveness of air filters.

Objective data. Information, such as air monitoring data from industry-wide surveys or calculations based on composition of a substance, demonstrating employee exposure to

respirable crystalline 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 materials, control methods, work practices, and environmental conditions in the University’s current operations.

Permissible Exposure Limit (PEL). A concentration of airborne respirable crystalline silica of 50 µm/m³, calculated as an 8-hour Time-Weighted Average (TWA).

Physician or other Licensed Health Care Professional (PLHCP). An individual whose legally permitted scope of practice (i.e. license, registration, or certification) allows him/her to independently provide or be delegated the responsibility to provide some or all of the particular health care required by this plan.

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 ISO 7708 1995: “Air quality particle size fraction definitions for health-related sampling”.

Exposure control plan elements

1. Identifying/evaluating exposures in construction and other settings

1.1 Silica exposures in construction settings. Table 1 identifies specific construction equipment and tasks which require protective measures, such as engineering, work practice and PPE requirements (see “Definitions” for definition of “construction”). Additional requirements and exceptions are described later in this section.

Table 1 addresses construction settings only. See Section 1.2 for non-construction activities.

Table 1 – Construction equipment and tasks requiring protection

Equip./Task	Mandatory engineering and work practice control methods	Required Respiratory Protection and Min. Assigned Protection Factor	
		4 hrs or less per shift	More than 4 hrs per shift
Stationary masonry saws	<ol style="list-style-type: none"> 1. Use saw equipped with integrated water delivery system that continuously feeds water to the blade 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions 	None	None
Handheld power saws (any blade diameter)	<ol style="list-style-type: none"> 1. Use saw equipped with integrated water delivery system that continuously feeds water to the blade 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions: 		
	When used outdoors	None	APF 10

	When used indoors	APF 10	APF 10
Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)	<p><u>For tasks performed outdoors only:</u></p> <ol style="list-style-type: none"> 1. Use saw equipped with commercially available dust collection system 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions 3. 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
Walk-behind saws	<ol style="list-style-type: none"> 1. Use saw equipped with integrated water delivery system that continuously feeds water to the blade 2. 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
Drivable saws	<p><u>For tasks performed outdoors only:</u></p> <ol style="list-style-type: none"> 1. Use saw equipped with integrated water delivery system that continuously feeds water to the blade 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions 	None	None
Rig-mounted core saws or drills	<ol style="list-style-type: none"> 1. Use tool equipped with integrated water delivery system that supplies water to cutting surface 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions 	None	None
Handheld and stand-mounted drills (including impact and rotary hammer drills)	<ol style="list-style-type: none"> 1. Use drill equipped with commercially available shroud or cowling with dust collection system 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions 3. 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 4. Use a HEPA-filtered vacuum when cleaning holes 	None	None
Dowel drilling rigs for concrete	<p><u>For tasks performed outdoors only:</u></p> <ol style="list-style-type: none"> 1. Use shroud around drill bit with a dust collection system. Dust collector must have a filter with 99% or greater efficiency and a filtercleaning mechanism 2. Use a HEPA-filtered vacuum when cleaning holes 	APF 10	APF 10
Vehicle-mounted drilling rigs for rock and concrete	<ol style="list-style-type: none"> 1. 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		

	1. Operate from within an enclosed cab and use water for dust suppression on drill bit	None	None
Jackhammers and handheld powered chipping tools	1. 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		
	1. Use tool equipped with commercially available shroud and dust collection system 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions 3. 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
Handheld grinders for mortar removal (i.e., tuckpointing)	1. Use grinder equipped with commercially available shroud and dust collection system 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions 3. 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	APF 10	APF 25
Handheld grinders for uses other than mortar removal	<u>For tasks performed outdoors only:</u>	None	None
	1. Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	OR		
	1. Use grinder equipped with commercially available shroud and dust collection system 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions 3. 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
Walk-behind milling machines and floor grinders	1. Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions	None	None
	OR 1. Use machine equipped with dust collection system recommended by the manufacturer 2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions 3. 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 4. When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes	None	None
Small drivable milling machines (less than half-lane)	1. Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant 2. Operate and maintain machine to minimize dust emissions	None	None
Large drivable milling machines (half-lane and larger)	<u>For cuts of any depth on asphalt only:</u> 1. Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust 2. Operate and maintain machine to minimize dust emissions	None	None
	<u>For cuts of four inches in depth or less on any substrate:</u> 1. Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust 2. Operate and maintain machine to minimize dust emissions	None	None
	OR		
	1. Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant 2. Operate and maintain machine to minimize dust emissions	None	None
Crushing machines	1. 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

	<ol style="list-style-type: none"> 2. Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions 3. Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station 		
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	1. Operate equipment from within an enclosed cab	None	None
	1. 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
Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: Demolishing, abrading, or fracturing silica-containing materials	1. Apply water and/or dust suppressants as necessary to minimize dust emissions	None	None
	OR		
	1. When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab	None	None

Note: 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, then 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.

In addition to the requirements found in Table 1, the following requirements apply in construction settings:

- For any task performed indoors or in enclosed areas, general or local exhaust must be provided to minimize the accumulation of visible airborne dust.
- For tasks performed using wet methods, water shall be applied at flow rates sufficient to minimize the release of visible dust.
- When tools, equipment or work processes are intended to be operated in an enclosed cab or booth, the cab or booth must:
 - Be maintained as free as practicable from settled dust
 - Be equipped with door seals and closing mechanisms that work properly
 - Be equipped with gaskets and seals that are in good condition and working properly

- Be under positive pressure, which is maintained through continuous delivery of fresh air. Intake air must be filtered through a filter that is 95% efficient in the 0.3-10 µm range (i.e. MERV-16 or better)
- Have heating and cooling capabilities for occupants/operators (as needed)

For equipment/tasks not listed in table 1, or when the engineering controls listed in the table are not fully implemented, the University will ensure that employees' exposure do not exceed the Permissible Exposure Limit (PEL). Objective data will be obtained to demonstrate that exposures are within limits. If air sampling is conducted to demonstrate that exposures are within limits, the requirements of sections 1.2-1.7 will apply.

1.2 Silica exposures in non-construction settings. Potential non-construction exposures to silica at the University of Minnesota include, but are not limited to:

- Foundry areas
- Street sweeping
- Ceramics areas
- Civil/structural engineering
- Geology
- Natural Resources Research Institute (NRRI)
- Soils labs

Initial exposure assessments will be conducted on each employee with exposure to respirable crystalline silica. Follow up (non-initial) monitoring may be required based on requirements in this section.

The employees' 8-hour TWA exposure will be quantified and evaluated on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to respirable crystalline silica.

1.3 Re-evaluation. Employees' exposures will be reassessed whenever there is any reason to believe that exposures have changed.

1.4 Employee notification of assessment results. Within 5 working days of completing an exposure assessment for in a construction setting, or 15 days for other settings, each affected employee will be individually notified in writing of the results of that assessment. This notification may be made by posting a copy of results in an appropriate location accessible to all affected employees.

Whenever an exposure assessment indicates that employee exposure is above the PEL, the written notification will describe in the corrective action being taken to reduce employee exposure to or below the PEL.

1.5 Observation of monitoring. Where air monitoring is performed, the University shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to respirable crystalline silica.

When observation of monitoring requires entry into an area where the use of protective clothing or equipment is required for any workplace hazard, the University shall provide the observer with protective clothing and equipment at no cost and shall ensure that the observer uses such clothing and equipment.

1.6 Records of air monitoring. Accurate records of all exposure measurements shall be made and maintained. This record shall include at least the following information:

- The date of measurement for each sample taken;
- The task monitored;
- Sampling and analytical methods used;
- Number, duration, and results of samples taken;
- Identity of the laboratory that performed the analysis;
- Type of personal protective equipment, such as respirators, worn by the employees monitored; and
- Name, employee identification number, and job classification of all employees represented by the monitoring, indicating which employees were actually monitored.

1.7 Records of objective data. Accurate records of all objective data relied upon to comply with this plan shall be made and maintained. This record shall include at least the following information:

- The crystalline silica-containing material in question;
- The source of the objective data;
- The testing protocol and results of testing;
- A description of the process, task, or activity on which the objective data were based; and
- Other data relevant to the process, task, activity, material, or exposures on which the objective data were based.

2. Methods of compliance

2.1 General. This section describes methods which will be employed (as needed and appropriate) to reduce employees' exposures to acceptable levels, ideally below the Action Limit.

2.2 Engineering and work practice controls. Feasible engineering and administrative/work-practice controls shall be utilized to reduce employees' exposures to

the lowest feasible levels. Where these controls are not adequate to reduce employees' exposures to below the PEL, they shall nonetheless, be used to reduce exposures to the lowest feasible level.

2.3 Abrasive blasting. Where abrasive blasting is conducted using silica-containing blasting media, or where abrasive blasting is conducted on substrates that contain crystalline silica, the University will comply with all other OSHA requirements pertaining to abrasive blasting.

2.4 Housekeeping measures. Dry sweeping or dry brushing shall not be used unless safer methods such as wet sweeping, HEPA-filtered vacuuming, or other safer methods are infeasible.

Compressed air shall not be used to be used to clean clothing or surfaces where such activity could contribute to employee exposure to respirable crystalline silica unless:

- The compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air; or
- No alternative method is feasible.

2.5 Regulated areas. Regulated areas will be established wherever an employee's exposure to airborne concentrations of respirable crystalline silica is, or can reasonably be expected to be, in excess of the PEL. All such areas shall demarcated from the rest of the workplace in a manner that minimizes the number of employees exposed to respirable crystalline silica within the regulated area.

Signs shall be posted at all entrances to regulated areas. Signs shall read as follows:

DANGER!
RESPIRABLE CRYSTALLINE SILICA.
MAY CAUSE CANCER.
CAUSES DAMAGE TO LUNGS.
WEAR RESPIRATORY PROTECTION IN THIS AREA.
AUTHORIZED PERSONNEL ONLY.

Access to regulated areas shall be limited to:

- Persons authorized and required by work duties to be present;
- Designated employee representative who are exercising the right to observe monitoring procedures; and
- Any person authorized by the Occupational Safety and Health Act or regulations issued under it to be in a regulated area.

Any person entering a regulated area will be provided with, and required to wear an appropriate respirator. All respirator use will comply with the University's

Respiratory Protection plan.

3. Respiratory protection

3.1 General. Respiratory protection will be provided to, and worn by employees under the following conditions:

Construction settings	<ul style="list-style-type: none">• When specified for tasks/equipment listed in Table 1• For tasks/equipment not specified in the table in Table 1 or when the controls specified in that table have not been fully implemented, and employees' exposures to crystalline silica exceed the PEL.
Non-Construction settings	When monitoring and/or objective data indicate that exposures are likely to exceed the PEL

Any use of respiratory protection will be in compliance with the University's Respiratory Protection plan.

4. Inspections in construction settings by competent person

4.1 General. Frequent and regular inspections of construction jobsites, materials and equipment shall be performed by a competent person. The purpose of these inspections will be to ensure that this plan is being complied with. When deficiencies or other concerns are observed during inspections, they shall be corrected as soon as practicable.

5. Medical surveillance

5.1 General. Medical surveillance which complies with this section will be provided to each employee who meets the following criteria:

Construction settings	Employees who will be required to use a respirator for 30 or more days per year, as required by Table 1 (see Section 1 of this plan).
Non-Construction settings	Each employee who will be exposed <i>at or above the action level</i> for 30 or more days per year.

The measures described in this section will be provided at no cost to the employee and at a time and place that is reasonably convenient to them.

5.2 Initial examination. An initial (baseline) medical examination will be conducted on each employee within 30 days after his/her initial assignment, unless the employee has

received a medical examination that meets the requirements of this section within the last three years.

The examination shall consist of;

- A medical and work history;
- A physical examination with special emphasis on the respiratory system;
- A chest X-ray, interpreted and classified by a NIOSH-certified B Reader;
- A pulmonary function test;
- Testing for latent tuberculosis infection; and
- Any other tests deemed appropriate by the PLHCP.

5.3 Periodic examinations. Periodic examinations will be conducted on each employee at least every three years, or more frequently if recommended by the PLHCP. The periodic examinations shall consist of the procedures/examinations in section 5.2 except testing for latent Tuberculosis infection.

5.4 Information provided to the PLHCP by the University. The PLHCP providing the medical examination shall have a copy of 29 CFR 1910.1053 (for non-construction employees) or 29 CFR 1926.1153 (for construction employees). The University will provide a copy if needed by the PLHCP.

The PLHCP shall also be provided with:

- A description of the employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to respirable crystalline silica;
- The employee's former, current, and anticipated levels of occupational exposure to respirable crystalline silica;
- A description of any personal protective equipment used or to be used by the employee, including when and for how long the employee has used or will use that equipment; and
- Information from records of employment-related medical examinations previously provided to the employee and currently within the control of the University.

5.5 PLHCP's written medical report for the employee. The PLHCP shall explain each employee's results to him/her and provide him/her with a written medical report within 30 days of each medical examination performed. The written report shall contain:

- A statement indicating the results of the medical examination, 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's use of respirators;

- Any recommended limitations on the employee's exposure to respirable crystalline silica; and
- A statement that the employee should be examined by a specialist (as described later in this section) if the chest X-ray provided in accordance with this section is classified as 1/0 or higher by the B Reader, or if referral to a specialist is otherwise deemed appropriate by the PLHCP.

5.6 PLHCP's written medical opinion to the University. The PLHCP shall provide a written medical opinion to University within 30 days of the medical examination. The written opinion shall contain only the following:

- The date of the examination;
- A statement that the examination has met the requirements of this section; and
- Any recommended limitations on the employee's use of respirators.

If the employee provides written authorization, the 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 in accordance with this section is classified as 1/0 or higher by the B Reader, or if referral to a specialist is otherwise deemed appropriate by the PLHCP.

The employee shall receive a copy of the written medical opinion within 30 days of each medical examination performed.

5.7 Additional examinations by specialists. If the PLHCP's written medical opinion indicates that an employee should be examined by a specialist, the University shall make available a medical examination by a specialist within 30 days after receiving the PLHCP's written opinion.

The University shall ensure that the examining specialist is provided with all of the information that the University is obligated to provide to the PLHCP in accordance with this section.

The University shall ensure that the specialist explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of the examination. The written report shall meet the requirements of this section.

The University shall obtain a written opinion from the specialist within 30 days of the medical examination. The written opinion shall meet the requirements of this section.

5.8 Records of medical surveillance. Accurate records of all medical examinations and procedures shall be made and maintained. The record shall include the following information about the employee:

- Name and employee identification number;
- A copy of the PLHCPs' and specialists' written medical opinions; and
- A copy of the information provided to the PLHCPs and specialists.

6. Employee training

6.1 General. Respirable Crystalline Silica shall be included in the University of Minnesota's Hazard Communication plan and addressed in ongoing Hazard Communication training. Training related to respirable crystalline silica shall also include:

- The health hazards associated with exposure to respirable crystalline silica including cancer, lung effects, immune system effects, and kidney effects.
- Specific tasks in the workplace that could result in exposure to respirable crystalline silica;
- Specific measures the University has implemented to protect employees from exposure to respirable crystalline silica, including engineering controls, work practices, and respirators to be used;
- The purpose and a description of the medical surveillance plan.
- The contents of this exposure control plan.

6.2 Qualifications of trainer. Training will be designed and provided by a person familiar with the applicable regulations, this plan, and the technical subject matter involved.

Legal references

The following standards are related to this exposure control plan:

- 29 CFR 1910.94
- 29 CFR 1910.134
- 29 CFR 1910.132-138 (Subpart I)
- 29 CFR 1910.1020
- 29 CFR 1910.1053
- 29 CFR 1910.1200
- 29 CFR 1926.1153