

1.0 PURPOSE and APPLICABILITY

- 1.1 It is the policy of the University of Pennsylvania (Penn) in coordination with the Office of Environmental Health and Radiation Safety (EHRS) to provide the Penn community with a safe and healthful environment. This program informs Penn employees of the appropriate procedures to follow in order to minimize exposure to crystalline silica.
- 1.2 The Silica Exposure Control Program applies to all University of Pennsylvania employees involved with activities that may result in the disturbance of silica-containing materials. The program will be reviewed by EHRS on an annual basis.

2.0 DEFINITIONS

- 2.1 **Action level** - A concentration of airborne respirable crystalline silica of 25 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), calculated as an 8-hour time-weighted average (TWA).
- 2.2 **Employee exposure** - The exposure to airborne respirable crystalline silica that would occur if the employee was not using a respirator.
- 2.3 **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.
- 2.4 **Permissible exposure limit (PEL)** - Airborne concentration of respirable crystalline silica in excess of $50 \mu\text{g}/\text{m}^3$, calculated as an 8-hour TWA.
- 2.5 **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.

3.0 RESPONSIBILITIES

- 3.1 The *Office of Environmental Health and Radiation Safety (EHRS)* is responsible for:
 - 3.1.1 Maintaining the University's Silica Exposure Control Program and ensuring that a competent person inspects job sites and oversees implementation of the exposure control plan.
 - 3.1.2 In coordination with managers and supervisors, identifying tasks that may result in exposure to crystalline silica exposure exceeding the action level.

- 3.1.3 Performing exposure monitoring of personnel within job descriptions and tasks identified as having the potential to exceed the respirable crystalline silica action level.
 - 3.1.4 Recommending engineering controls, safe work practices and or personal protective equipment to minimize employee exposure to crystalline silica.
 - 3.1.5 Providing consultation to ensure occupant safety during construction, renovation or demolition projects that may result in exposure to respirable crystalline silica.
 - 3.1.6 Providing respiratory protection training and fit testing to employees who wear respirators. Coordinate medical clearance and surveillance with HUP Occupational Medicine.
 - 3.1.7 Provide or coordinate training for employees who may be exposed to respirable crystalline silica.
- 3.2 ***Supervisors*** are responsible for:
- 3.2.1 Notifying EHRS of tasks that may result in employee exposure to crystalline silica.
 - 3.2.2 Notifying EHRS of unusual conditions or changes in work practices that would render the existing EHRS exposure assessments as being unrepresentative of the typical crystalline silica exposure.
 - 3.2.3 Ensuring that employees receive appropriate training relating to silica exposure and protective measures.
 - 3.2.4 Enforcing the use of engineering controls, safe work practices and assigned personal protective equipment to minimize exposure to crystalline silica.
- 3.3 ***FRES Design & Construction Project Managers*** are responsible for:
- 3.3.1 Requiring contractors that perform tasks that disturb silica-containing materials to submit a plan describing the methods and procedures to be used to protect the Penn community from crystalline silica.
 - 3.3.2 Ensuring contractors completing outdoor projects are aware of the requirement to comply with the City of Philadelphia's Construction/Demolition Dust Control Requirements ([Air Management Regulation \(AMR\) II. Section IX](#)).
- 3.4 ***Employees*** are responsible for:
- 3.4.1 Using engineering controls, safe work practices, administrative controls and assigned personal protective equipment.
 - 3.4.2 Restricting access to the work area where elevated concentrations of airborne crystalline silica may be expected.

- 3.4.3 Controlling emissions from the work to prevent exposure to building occupants, bystanders and other trades not involved with the task.
- 3.4.4 Notifying supervisors of unusual work conditions or changes in work practices that would render existing EHRS exposure assessments as being unrepresentative of the typical crystalline silica exposure.

4.0 PROCEDURES

- 4.1 At Penn, the following tasks have been identified as having the potential to expose employees to respirable crystalline silica:
 - 4.1.1 **Athletics & Recreation** – Installation/use of sand or diatomaceous earth in pool filtration system.
 - 4.1.2 **Facilities & Real Estate Services (FRES)**
 - 4.1.2.1 **Masons/Plumbers/Other** – Construction/demolition/renovation and any maintenance activities involving work with plaster, concrete, ceramic tile and natural mineral products.
 - 4.1.2.2 **Housekeeping** – General cleanup of areas containing potential silica containing particles from maintenance operations.
 - 4.1.3 **School of Design/Fine Arts** – Pottery, clay sculpting and concrete mixing.
 - 4.1.4 **School of Dental Medicine** – Prosthetics laboratories.
 - 4.1.5 **School of Veterinary Medicine** – New Bolton Center
 - 4.1.5.1 **Maintenance Employees** – involved with installation of sand or diatomaceous earth in pool filtration system and/or involved with plaster, concrete, ceramic tile and natural Mineral products in construction/renovation and demolition activities.
 - 4.1.5.2 **Maintenance Employees** – involved with saw cutting or jack hammering of concrete.
- 4.2 EHRS will consult with managers and supervisors to identify possible tasks that may place employees at risk of exposure to crystalline silica.
- 4.3 EHRS will evaluate tasks that have the potential for crystalline silica exposure. EHRS will coordinate job safety analyses (JSA) with supervisors to identify hazards associated with the tasks and identify the appropriate engineering controls, administrative controls, safe work practices and personal protective equipment required.
- 4.4 EHRS may conduct exposure monitoring for respirable crystalline silica particles during at-risk tasks in order to characterize the employee exposure.

4.5 When the following construction-related equipment is used, or tasks performed on materials containing crystalline silica, the exposure controls listed in the tables below shall be implemented:

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	<ul style="list-style-type: none"> Use saw equipped with integral HEPA vacuum or water delivery system that continuously feeds water to the blade. Operate and maintain tools in accordance with manufacturer's instructions to minimize dust emissions. 	None	None
(ii) Handheld power saws (any blade diameter)	<ul style="list-style-type: none"> Use saw equipped with integral HEPA vacuum or 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

Equipment/Task	Engineering and work practice control methods:	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)	For tasks performed outdoors only: <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 be equipped with a HEPA filter. 	None	None
(vi) Rig-mounted core saws or drills	<ul style="list-style-type: none"> • Use tool equipped with integrated water delivery system that supplies water to cutting surface. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. 	None	None

Equipment/Task	Engineering and work practice control methods:	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills)	<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 be equipped with a HEPA filter. • Use a HEPA-filtered vacuums when cleaning the drilled work area. 	None	None
(viii) Dowel drilling rigs for concrete	<p>For tasks performed outdoors only:</p> <ul style="list-style-type: none"> • Use shroud around drill bit with a dust collection system. Dust collector must be equipped with a HEPA filter. • Use a HEPA-filtered vacuums when cleaning the drilled hole area. 	APF 10	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
(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		
	<ul style="list-style-type: none"> • 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 be equipped with a HEPA Filter. 		
	-When used outdoors:	None	APF 10
	-When used indoors or in an enclosed area:	APF 10	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
(xi) Handheld grinders for mortar removal (i.e., tuckpointing)	<ul style="list-style-type: none"> • 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. • Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and be equipped with a HEPA Filter. 	APF 10	APF 25

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	For tasks performed outdoors only:	None	None	
	<ul style="list-style-type: none"> • Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. 			
	OR			
	<ul style="list-style-type: none"> • Use grinder equipped with commercially available shroud and HEPA filtered dust collection system. • 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 HEPA filter 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	

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	<ul style="list-style-type: none"> • 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). • 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. 	None	None
(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	<ul style="list-style-type: none"> • Operate equipment from within an enclosed cab. • When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions. 	None	None

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

- 4.6 If respiratory protection is required, EHRS shall include the employee(s) in Penn’s respiratory protection program. EHRS will provide training and respirator fit testing. EHRS will assist the employee/supervisor with coordinating medical clearance and surveillance with HUP Occupational Medicine.
- 4.7 For tasks performed indoors or in enclosed areas, a means of exhaust must be provided to minimize the accumulation of visible airborne dust.
- 4.8 Building air handling systems, including outside air intakes and return air systems located within the work area, must be protected from entraining crystalline silica released from construction/demolition or renovation activities.
- 4.9 For tasks involving wet methods, apply water at flow rates sufficient to minimize release of visible dust.
- 4.10 Compressed air and dry sweeping or dry brushing should not be used to clean up or remove dust from clothing unless no other option, such as HEPA-filtered vacuuming, is feasible.
- 4.11 Access shall be restricted to areas where there is potential for exposure to respirable crystalline silica exceeding the action level. The specific means shall be designed by the party performing the task and approved by EHRS.

- 4.12 Outside contractors performing work in or around Penn facilities that involve the disturbance of silica-containing materials must as part their Site Safety Plan for FRES, include a dust control work plan to EHRS that defines the methods & procedures to be implemented in order to safely perform the project and control emissions.

5.0 RECORDKEEPING

- 5.1 EHRS maintains all Penn training documentation.
- 5.2 EHRS maintains job safety analysis (JSA) and other task evaluation forms.
- 5.3 EHRS maintains respirator fit testing documentation.
- 5.4 EHRS maintains all sampling data.
- 5.5 FRES Design & Construction maintains contractor silica emissions control work plans and copies of City of Philadelphia Dust Control Permit if applicable to the project.
- 5.6 Occupational Medicine maintains all medical clearance and surveillance information.

6.0 RESOURCES

- [OSHA Safety and Health Topics – Crystalline Silica](#)
- [City of Philadelphia Dust Control Permit Information](#)