15. Respirable Crystalline Silica

This Respirable Crystalline Silica Program was developed to prevent employee exposure to hazardous levels of respirable crystalline silica that could result through construction activities or nearby construction activities occurring on worksites. Respirable crystalline silica exposure at hazardous levels can lead to lung cancer, silicosis, chronic obstructive pulmonary disease, and kidney disease and is linked to auto-immune disorders.

Scope

All work involving chipping, cutting, drilling, grinding, or similar activities on materials containing crystalline silica can lead to the release of respirable-sized particles of crystalline silica (i.e., respirable crystalline silica). Crystalline silica is a basic component of soil, sand, granite, and many other minerals. Quartz is the most common form of crystalline silica. Many materials found on constructions sites include crystalline silica; including but not limited to – cement, concrete, asphalt, pre-formed structures (inlets, pipe, etc.) and others. Consequently, the City of Mercer Island has developed this program to address and control these potential exposures to prevent our employees from experiencing the effects of occupational illnesses related to respirable crystalline silica exposure.

This program applies to all employees who have the potential to be exposed to respirable crystalline silica when covered by the WISHA Standard. It is the City's goal to maintain airborne levels below the action level of 25µ/m3, however the City will ensure that all employees with potential silica exposure have training, equipment, and established work practices to minimize employee exposure above the action level of 25µ/m3.

Definitions

Action Level: a concentration of airborne respirable crystalline silica of 25µ/m3, calculated as an 8-hour time weighted average.

Competent Person: employee who can identify silica hazards and has authorization to take corrective action.

Construction Work: any part of excavation, construction, alteration, demolition or repair of structures, roads, utilities, or buildings.

Dust Mask: filtering facepiece rated N-95 or better with NIOSH approval and an assigned protection factor of 10.

High Efficiency Particulate Air (HEPA) filter: filter media that is at least 99.97% effective against particles that are 0.3 microns (µ) or larger in diameter.

Permissible Exposure Limit (PEL): a concentration of airborne respirable crystalline silica of 50µ/m3, calculated as an 8-hour time weighted average.

Respirable Crystalline Silica: quartz, cristobalite, and/or tridymite contained in airborne particles that are small enough to reach into the lungs.

Short Term Exposure Limit (STEL): a concentration of airborne respirable crystalline silica of 300µ/m3, calculated as a 15-minute time weighted average.

General Rules

- Engineering and work-practice controls must be used to reduce exposure to respirable crystalline silica to or below the PEL.
- Compressed air cannot be used to clean respirable silica dust off surfaces or clothing.
- Dry sweeping or brushing are prohibited on any respirable silica-containing dust. Wet methods or HEPA-filtered vacuuming is required.
- When an employee performs multiple tasks in Table 1 in a shift and the total duration of all tasks combined is over 4 hours, the required respiratory protection for each task is the one specified for over 4 hours.
- Any material that contains silica is a hazardous material. A current Safety Data Sheet (SDS), labels and training in hazard communication are required. Signs may be required in some situations.
- The Safety Data Sheet (SDS) for any sandblasting or grinding media cannot list any crystalline silica as a component.
- Tools and equipment that are purchased for silica exposure control must be rated for the job. This includes enclosed cabs, dust collection systems, water delivery systems and air filtration.
- A silica competent person must make frequent and regular inspections of jobsites, materials, and equipment to implement this plan.
- Any employee that may be exposed to respirable crystalline silica must have training before potential exposure.
- This written program is reviewed annually and updated as necessary.

Exposure Assessment

All City of Mercer Island tasks that may produce silica dust are listed in the table below. Any tasks that are not listed must have an exposure assessment done through industrial hygiene air monitoring.

Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica				
Construction task or equipment operation		**Engineering and work practice control methods**	**Required respiratory protection**	
			≤ 4 hours/shift	**>4 hours/shift**
1	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
2a	Handheld power saws (any blade diameter) when used outdoors	• Use saw equipped with integrated water delivery system that continuously feeds water to the blade.	None	N95 (or greater efficiency) filtering

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Construction task or equipment operation		**Engineering and work practice control methods**	**Required respiratory protection**	
			≤ 4 hours/shift	**>4 hours/shift**
		• Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		facepiece or half mask
2b	Handheld power saws (any blade diameter) when used indoors or in an enclosed area	• 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.	N95 (or greater efficiency) filtering facepiece or half mask	N95 (or greater efficiency) filtering facepiece or half mask
3	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
4a	Walk-behind saws when used outdoors	• 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
4b	Walk-behind saws when used indoors or in an enclosed area	• 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.	N95 (or greater efficiency) filtering facepiece or half mask	N95 (or greater efficiency) filtering facepiece or half mask

Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica				
Construction task or equipment operation		**Engineering and work practice control methods**	**Required respiratory protection**	
			≤ 4 hours/shift	**>4 hours/shift**
5	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
6	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
7	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
8	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. • Use a HEPA-filtered vacuum when cleaning holes.	N95 (or greater efficiency) filtering facepiece or half mask	N95 (or greater efficiency) filtering facepiece or half mask

Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica				
Construction task or equipment operation		**Engineering and work practice control methods**	**Required respiratory protection**	
			≤ 4 hours/shift	**>4 hours/shift**
9a	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
9b	Vehicle-mounted drilling rigs for rock and concrete	• Operate from within an enclosed cab and use water for dust suppression on drill bit.	None	None
10a	Jackhammers and handheld powered chipping tools when used outdoors	• Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.	None	N95 (or greater efficiency) filtering facepiece or half mask
10b	Jackhammers and handheld powered chipping tools when used indoors or in an enclosed area	• Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.	N95 (or greater efficiency) filtering facepiece or half mask	N95 (or greater efficiency) filtering facepiece or half mask
10c	Jackhammers and handheld powered chipping tools when used outdoors	• 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.	None	N95 (or greater efficiency) filtering facepiece or half mask
10d	Jackhammers and handheld powered chipping tools when used indoors or in an enclosed area	• 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.	N95 (or greater efficiency) filtering facepiece or half mask	N95 (or greater efficiency) filtering facepiece or half mask

Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica				
Construction task or equipment operation		**Engineering and work practice control methods**	**Required respiratory protection**	
			≤ 4 hours/shift	**>4 hours/shift**
		• 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.		
11	Handheld grinders for mortar removal (i.e., tuckpointing)	• 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 have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.	N95 (or greater efficiency) filtering facepiece or half mask	Powered air-purifying respirator (PAPR) with P100 filters
12a	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. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
12b	Handheld grinders for uses other than mortar removal when used outdoors	• 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 have a filter with 99% or greater efficiency	None	None

Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica				
Construction task or equipment operation		**Engineering and work practice control methods**	**Required respiratory protection**	
			≤ 4 hours/shift	**>4 hours/shift**
		and a cyclonic pre-separator or filter-cleaning mechanism.		
12c	Handheld grinders for uses other than mortar removal when used indoors or in an enclosed area	• 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 have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.	None	N95 (or greater efficiency) filtering facepiece or half mask
13a	Walk-behind milling machines and floor grinders	• Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
13b	Walk-behind milling machines and floor grinders	• Use machine equipped with dust collection system recommended by the manufacturer. • 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-	None	None

Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica				
Construction task or equipment operation		**Engineering and work practice control methods**	**Required respiratory protection**	
			≤ 4 hours/shift	**>4 hours/shift**
		filtered vacuum to remove loose dust in between passes.		
14	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. • Operate and maintain machine to minimize dust emissions.	None	None
15a	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. • Operate and maintain machine to minimize dust emissions.	None	None
15b	Large drivable milling machines (half-lane and larger) 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. • Operate and maintain machine to minimize dust emissions.	None	None
15c	Large drivable milling machines (half-lane and larger) for cuts of four inches in depth or less on any substrate	• Use a machine equipped with supplemental water spray designed to suppress dust. • Water must be combined with a surfactant. • Operate and maintain machine to minimize dust emissions.	None	None
16	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). • Operate and maintain machine in accordance with manufacturer's	None	None

Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica				
Construction task or equipment operation		**Engineering and work practice control methods**	**Required respiratory protection**	
			≤ 4 hours/shift	**>4 hours/shift**
		instructions to minimize dust emissions. • Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote-control station.		
17a	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
17b	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	• 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
18a	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

Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica				
Construction task or equipment operation		**Engineering and work practice control methods**	**Required respiratory protection**	
			≤ 4 hours/shift	**>4 hours/shift**
18b	Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials	• When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None	None

For tasks performed indoors or in enclosed areas, provide HEPA exhaust as needed to minimize the accumulation of visible airborne dust. For tasks performed using wet methods, apply water at flow rates sufficient to minimize release of visible dust.

An enclosed cab or booth must have all the following:

- Maintained as free as practicable from settled dust
- Door seals and functional closing mechanisms
- Gaskets and seals in good condition
- Maintained positive pressure through continuous delivery of fresh air
- Intake air is filtered at 95% efficiency for particles 0.3-10.0-micron diameter
- Heating and cooling capabilities

Hazard Communication and Training

Respirable crystalline silica is subject to Globally Harmonized System rules. A current Safety Data Sheet (SDS) must be available from Public Works management. GHS-compliant labels are required on packaging for silica-containing materials. For materials such as cured concrete, asphalt, sand, and natural rock, silica is likely present. Respirable dust is only generated during destructive processes.

In non-construction regulated areas, signs with specific hazard wording must be posted at any entrances to the area:

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

Any employee who will be exposed to respirable crystalline silica must have training before assignment to those tasks. This training includes information on hazards of silica, tasks that can cause exposure, control methods, and identification of the competent person on jobsites.

Respiratory Protection and Medical Surveillance

When employees use respirators, the City's Respiratory Protection Program applies. Voluntary use of a filtering facepiece is allowed without training or medical clearance; however, wearing one when facial hair interferes with the seal is prohibited. Whenever employees are required to wear a respirator 30 days or more/year, they will be offered a medical surveillance physical at assignment and every 3 years after. The contents of this physical are set by DOSH rules and are performed by a qualified, licensed medical professional.

Where respiratory protection is required by this program, the City will provide each employee an appropriate respirator that complies with the requirements of the City's respiratory protection program and the DOSH Respiratory Protection Standard (WAC 296-842).