SILICA PROGRAM

GENERAL

I. SILICA HEALTH HAZARDS

Crystalline Silica (silica) is a mineral commonly found in rock, stone, sand, concrete, asphalt and masonry material. Silica becomes a health hazard when these materials are broken up or crushed into very fine respirable ***silica dust*** that is breathed into the lungs. Silica dust damages lung tissue and can lead to silicosis, a serious and sometimes fatal lung disease. Other diseases that can occur from breathing in silica dust are chronic bronchitis, tuberculosis, chronic obstructive pulmonary disease (COPD) and lung cancer.

Below are some common work practices that can lead to silica dust exposure:

- Drilling, cutting, grinding, chipping or hammering concrete, stone or masonry.
- Abrasive blasting
- Crushing rock or concrete, mixing concrete.
- Milling concrete and asphalt
- Loading, dumping, and hauling rock and concrete.
- Tunneling operations
- Dry sweeping or using compressed air to move dust, sand or rock.

II. WHEN DO THE SILICA RULES APPLY?

The silica rules apply to any work operation that generates silica dust except where employee exposure to the silica dust will remain below the ***action level*** of 25 micrograms of respirable crystalline silica per cubic meter of air (25 $\mu g/m^3$) calculated as an 8-hour time-weighted average (TWA) under any foreseeable conditions. There are a few work operations that can reasonably be expected to remain below the action level such as pouring concrete and mixing small batches of concrete, however ***most tasks that create silica dust will be at or above the action level.***

Employees who are exposed to silica dust must be protected with engineering controls (wet or vacuum), work practice controls, and sometimes respirators so as not to exceed the permissible exposure limit (PEL) of 50 $\mu g/m^3$ calculated as an 8-hour time-weighted average (TWA).

III. MIOSHA STANDARD REFERENCE

The requirements for silica are covered in the Construction Safety and Health Standard Part 690 - Silica in Construction.

IV. TRAINING

Employees must be trained in the recognition of work operations that generate silica dust, the hazards associated with silica dust, and ways to limit exposures.

STEPS TO COMPLY WITH THE SILICA RULES

STEP 1: DETERMINE WHICH COMPLIANCE METHOD TO USE

When a work operation creates silica dust, the competent person (typically the foreman) must determine which of the ***two compliance method options described below*** will be used to control exposures to silica dust before work begins:

Option #1: Table 1

Refer to Table 1 (Pages 5-10) to determine if the work operation is listed as one of the 18 common equipment/tasks ***and*** if all the engineering controls, work practices, and respiratory protection that are specified in the table can be fully and properly implemented. If Table 1 can be used, no additional assessments or engineering controls are required unless exposure conditions have been altered.

-OR-

Option #2: Exposure Assessment and Alternative Exposure Controls

See criteria below:

A. ***Exposure Assessment***: An independent exposure assessment must be conducted to determine who may be exposed to silica dust at or above the ***action level*** of 25 $\mu g/m^3$ calculated as an 8-hour TWA during the work operation. The assessment is based on any air monitoring data or objective data that is sufficient to accurately characterize exposures.

   If ***objective data*** is used for the exposure assessment, the information must demonstrate how the employee is exposed to silica dust based on the specific material, process, or work operation. The data must reflect workplace conditions closely resembling or with a higher exposure potential than the types of material, control methods, work practices and environmental conditions in the employer's current operations. An accurate record of the information must be kept when relying on objective data to comply with the silica standard. The record must include:

   a. The date of the measurement for each sample taken;
   b. The task monitored;
   c. Sampling and analytical methods used;
   d. The number, duration and results of sample taken;
   e. The identity of the laboratory that performed the analysis;
   f. The type of personal protective equipment used (*e.g.*, type of respirator worn); and

g. The name, social security number and job classification of all employees represented by the monitoring.

B. ***Alternate Exposure Controls***: Alternate exposure controls must be used to limit employee exposures to the PEL of 50 micrograms of respirable crystalline silica per cubic meter of air (50 $\mu g/m^3$) calculated as an 8-hour time-weighted average (TWA). The alternate exposure controls are as follows:

a. ***Engineering controls*** are *wet method* and *HEPA-filtered vacuuming*. Wet methods involve applying water or foam at the point where dust is created to keep the dust from getting into the air (i.e. an integrated water delivery system on a stationary masonry saw). HEPA-filtered vacuuming removes dust by capturing it at or near the point where it is created (i.e. a dust collector on a handheld grinder).

b. ***Work practice controls*** are performing a task in a way that reduces or limits exposures (i.e. following the manufacturers' recommendations for equipment usage and maintenance.) or limiting the duration that an employee is exposed (i.e. rotating employees).

c. ***Respirators*** are typically required only when engineering controls cannot reduce exposures to acceptable levels.

STEP 2: RESPIRATORY PROTECTION REQUIREMENTS

A written respiratory protection program must be on site when work operations require the use of a respirator. The designated competent person (typically the foreman) must implement all the program requirements (i.e. proper selection, clean shaven, fit testing, and training). Refer to the **Respiratory Protection Program** for additional information.

Medical exams (including chest X-rays and lung function tests) must be offered to employees who are required to wear respirators for 30 or more days per year. An accurate record must be kept which includes the following information about the employee:

a. Name and social security number;
b. A copy of the physicians and other licensed health care professionals (PLHCPs) and specialists' written opinions (See Appendix B);
c. A copy of the information given to PLHCPs and specialists (i.e. a description of the employee's former, current and anticipated duties and exposure levels; a description of the PPE used by the employee; and information from previous employment-related medical examinations that is currently within the control of the employer).

STEP 3: RESTRICT ACCESS TO OTHER WORKERS

Other workers shall be prevented from entering areas where silica dust is at or above the action level (typically in the areas where respirators are required) using signs, barricades,

enclosures, spotters, or only perform the work when area is cleared of other contractors and workers.

STEP 4: HOUSEKEEPING

Only use wet-sweeping or a HEPA-filtered vacuum for cleaning surfaces or clothing unless the competent person determines that dry sweeping is the only feasible method.

Compressed air should not be used to clean clothing or surfaces unless the compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air.

STEP 5: WRITTEN EXPOSURE CONTROL PLAN

The competent person must complete the **Silica Exposure Control Plan - Appendix A** for each work operation/task that generates silica dust (whether using Table 1 or alternative exposure control methods).

STEP 6: REASSESS WHEN WORK CONDITIONS HAVE CHANGED

Exposures, engineering controls, and work practices must be reassessed whenever a change in the work operation, equipment, personnel, or work practices may result in new or additional exposures at or above the action level.

TABLE 1

Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(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
(2) 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. • When used indoors or in an enclosed area.	None APF 10	APF 10 APF 10
(3) Handheld power saws for cutting fiber-cement board (with blades diameter of 8" 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
(4) Walk-behind saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • When used outdoors. • When used indoors or in an enclosed area.	None APF 10	None APF 10

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**
(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.	APF 10	APF 10

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**
(9) 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
(10) 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 and a filter-cleaning mechanism.		
	• When used outdoors.	None	APF 10
	• When used indoors or in an enclosed area.	APF 10	APF 10
(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.	APF 10	APF 25
	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.		

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**
(12) 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. **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. 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. • When used indoors or in an enclosed area.	None None None	None None APF 10
(13) 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. **OR** 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-filtered vacuum to remove	None None	None None

	loose dust in between passes.		

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**
(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
(15) 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
	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

TABLE 1

	OR • 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, conveyors, 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	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
(17) 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. 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	None None
(18) 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. **OR** When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None None	None None