

# SILICA EXPOSURE CONTROL

Silica is the second most common mineral on earth, found in the common form as “sand” and “rock”. Silica is the compound formed from the elements silicon (Si) and oxygen (O) and has a molecular form of  $\text{SiO}_2$ . The three main forms or ‘polymorphs’ of silica are alpha quartz, cristobalite and tridymite. The polymer most abundant and most hazardous to human health is alpha quartz, and is commonly referred to as crystalline silica.

## Health Hazards Associated with Silica Exposure

The health hazards of silica come from breathing in the dust. If crystalline silica becomes airborne through industrial activities, exposures to fine crystalline silica dust (*specifically exposure to the size fraction that is considered to be respirable*) can lead to a disabling, sometimes fatal disease called silicosis. The fine particles are deposited in the lungs, causing thickening and scarring of the lung tissue. The scar tissue restricts the lungs’ ability to extract oxygen from the air. This damage is permanent, but the symptoms of the diseases may not appear for many years. As noted in the following Figure, (respirable) silica dust is very small, and is not visible to the human eye.

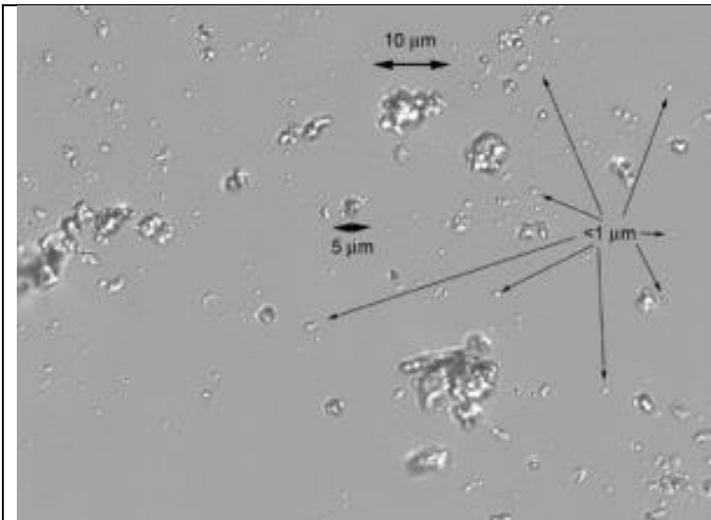


Figure 1: Crystalline silica up close. 1000 times magnification of sand dust. These particles are small enough to be trapped in lung tissue.

A worker may develop any of three types of silicosis, depending on the concentration of silica dust and the duration of the exposure:

- Chronic Silicosis: Develops after 10 or more years of exposure to crystalline silica and relatively low concentrations.
- Accelerated Silicosis: Develops 5 to 10 years after initial exposure to crystalline silica at high concentrations.
- Acute Silicosis: Develops within weeks, or 4 to 5 years, after exposure to very high concentrations of crystalline silica.

Tervo Masonry, llc

Initially, workers with silicosis may have no symptoms; however, as the disease progresses, workers may experience:

- Shortness of Breath.
- Severe Cough.
- Weakness.

These symptoms can worsen over time and lead to death. Exposure to silica has also been linked to other diseases, including bronchitis, tuberculosis, and lung cancer.

### **Silica Exposures at Tervo Masonry, llc.**

Many of the activities performed on Tervo Masonry, llc. Projects result in the creation/release of silica dust, thus exposing our employees. These activities include, but are not necessarily limited to:

- *Sweeping*
- *Jack-hammering*
- *Saw-cutting*
- *Drilling (of concrete)*
- *Excavating and Truck Loading activities.*

### **Silica Exposure Prevention & Control: Statement of Purpose**

Tervo Masonry, llc. is committed to providing a safe and healthy workplace to our employees, recognizing the right of workers to work in a safe and healthy work environment and ensuring that Tervo Masonry, llc.'s activities do not adversely affect the health and safety of any other persons.

This commitment includes ensuring every reasonable precaution is taken to protect our employees (and others) from the adverse health effects associated with exposure to silica.

### **Responsibilities**

Due to the risk posed by respirable silica, it is critical that all personnel involved in activities that could potentially create silica dust take specific actions to ensure that, as much as practicable, a hazard is not created. In recognition of this, the following (Silica related) responsibilities have been established and must be adhered to:

### **Blacktop Specialists Senior Management is responsible for:**

Tervo Masonry, LLC

## Tervo Masonry, llc

- Regularly evaluating new equipment and technologies that become available, as able/appropriate, purchasing the “best available” equipment/technologies (*within Tervo Masonry, llc.’s capabilities*). Equipment/technologies with (silica) dust suppression and/or capture technologies will generally be given preference over equipment/technologies that lack such.
- Ensuring project and/or task specific Exposure Control Plans (ECPs) are developed communicated and effectively implemented as appropriate.
- Ensuring that all employees (*i.e. Managers, Supervisors and Workers*) receive the necessary education and training related to this Policy, as well as project/task specific ECPs.
- (*In conjunction with the Tervo Masonry, llc. Health & Safety Plan*) Conducting a review of this Policy, as well as: (1) project/task specific Exposure Control Plan, (2) available exposure monitoring data, (3) Industry/Regulatory information, and (4) new/emerging equipment/technologies on a regular (*i.e. annual*) basis.

### **Blacktop Specialist Foremen are responsible for:**

- Ensuring that all the tools, equipment, PPE and materials (*including water*) necessary to implement the Exposure Control Plan is available (*and in good working order*) prior to allowing work activities to commence.
- Ensuring that all workers (*under the supervisor’s direction and control*) have received the necessary education and training. As appropriate, each supervisor must ensure that workers are available to “demonstrate competency” for identified tasks.
- Ensuring that workers adhere to the project/task specific Exposure Control Plan, including PPE.
- Coordinating work activities with the Owner/Prime Contractor as required, and/or otherwise implementing the controls necessary to protect others (*i.e. erecting of barricades and signage*) who could be adversely effected by Tervo Masonry, llc.’s acts (*or omissions*).

### **Blacktop Specialist Employees (and subcontracted employees) are responsible for:**

- Knowing the hazards of silica dust exposure.
- Using the assigned protective equipment in an effective and safe manner.

- Working in accordance with the project/task specific Exposure Control Plan.
- Reporting (*immediately*) to their supervisor, any hazards (*i.e. unsafe conditions, unsafe acts, improperly operating equipment, etc.*).

## Exposure Limits

**Exposure Limits/Considerations:** The Occupational Health & Safety Regulation (OSHA) lists an permissible exposure limit (PEL) for respirable crystalline silica (including quartz) of 0.50 milligrams per cubic metre (mg/m<sup>3</sup>) of air volume. This is a concentration to which nearly all workers could be exposed for eight hours a day, five days a week, without adverse health effects. However, as a suspected carcinogen, crystalline silica is also an ALARA substance, and exposures must be reduced to levels **As Low As Reasonably Achievable** below the OEL.

## Silica Safe Work Procedures Identification

Tervo Masonry, llc. will ensure that suitable written procedures for controlling the risk of silica exposure are developed. This document/table summarizes the silica control options generally available on Tervo Masonry, llc. sites/projects, and will be complimented with project/tasks specific Exposure Control Plans as necessary. This document and any supplemental work procedures/ECPs will be made readily available for review by all affected workers.

The health hazards of silica come from breathing in the dust. In addition to identifying the specific activities/areas where personnel could be exposed to silica dust, the “amount” of exposure and “duration” of exposure must also be considered. With consideration to these three factors, activities performed by Tervo Masonry, llc. (*or that are otherwise occurring in proximity to Tervo Masonry, llc.’s activities*) that expose our employees (*as well as members of the public and other workers*) to the dust include, but are not necessarily limited to:

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
(i) Stationary masonry saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade Operate and maintain tool in	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
	accordance with manufacturer's instructions to minimize dust emissions		
(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 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	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
	water delivery system that continuously feeds water to the blade Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
(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:		
	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
(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

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
	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 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>i.e.</i> , 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		

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

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
	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
	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	Apply water and/or dust suppressants	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
utility vehicles for tasks such as grading and excavating but not including: Demolishing, abrading, or fracturing silica-containing materials	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

- Surface preparation activities such as: (1) the use of Blow-Packs, (2) the use of Bobcats with “sweeper” attachments, (3) the use of Sweeper trucks and (4) hand sweeping.
- Jack-hammering (*of both asphalt and concrete*).
- Saw-cutting (*of both asphalt and concrete*).
- Drilling (*of concrete*).
- Granular Surface Preparation activities (*i.e. grading and rolling*), and

**Silica Exposure Prevention & Control: Risk Assessment**

**Risk Assessment:** Tervo Masonry, llc. will use a variety of methods to assist with the “assessment” of (*possible and actual*) silica exposures. These methods will include, but may not necessarily be limited to:

- Reviewing data/reports available in the public domain.
- Regularly consulting with the Safety Resources/Safety Managers from firms who perform similar work.

**Risk Control**

**Control Methods:** When determining measures to reduce or eliminate worker exposure to silica dust, Tervo Masonry, llc. will generally select a combination of controls, listed in order of preference:

- Elimination and Substitution.
- Engineering.
- Administrative.

Tervo Masonry, llc

- Personnel Protection Equipment (PPE).

**Engineering Controls:** Engineering controls are those controls which aim to control or otherwise minimize the release of crystalline silica. Two “common” engineering control options are available to Tervo Masonry, llc. in many circumstances. These include the Local Exhaust Ventilation (LEV) and Wet Dust Suppression (WDS) systems.

**LEV Systems:** Tools/appliance specific LEV systems are available on some tools/appliances. Such LEV systems are generally comprised of a shroud assembly, a hose attachment, and a vacuum system. Dust-laden air is collected within the shroud, drawn into the hose attachment, and conveyed to the vacuum, where it is filtered and discharged. “Large scale” LEV systems, such those available on some Vacuum Trucks and Mobile Sweepers, may also be employed (at times) on Tervo Masonry, llc. projects.

When/if LEV systems are used, Tervo Masonry, llc. will employ the following systems and safe work practices:

- Vacuum attachment systems that capture and control dust at its source whenever possible.
- Dust control systems will be maintained in optimal working condition.
- Grinding wheels will be operated at the manufacturer’s recommended RPM (*operating in excess of this can generate significantly higher airborne dust levels*).
- HEPA or good quality, multi-stage vacuum units (*approved for use with silica dust*) will be used in accordance with the manufacturer’s instructions.
- Whenever possible, concrete grinding will be completed when the concrete is wet (*thus dust release will be significantly reduced*).

When WDS systems are used, Tervo Masonry, llc. will employ the following systems and safe work practices:

- If water is not readily available on the specific Tervo Masonry, llc. project, the project supervisor will arrange to have a water tank delivered to the site for use.
- Pneumatic or fuel (*i.e. gasoline*) powered equipment will generally be used instead of electrically powered equipment if water is the method of dust control, unless the electrical equipment is specifically designed to be used in such circumstances.
- Pressure and flow rate will be controlled in accordance with the tool manufacturer’s specifications.
- When sawing concrete, tools that provide water directly to the blade will be used if possible.
- Wet slurry will be cleaned from work surfaces when the work is complete, if/when necessary.

**Administrative Controls:** Administrative controls are those that aim to control or otherwise minimize the release of silica through the use of work procedure and work methods, rather than by affecting the actual physical work. Common examples of administrative controls include, but are not limited to:

- Posting of warning signs.

Tervo Masonry, LLC

## Tervo Masonry, llc

- Rescheduling of work as to avoid the activities of others.
- Relocating unprotected workers away from dusty areas.

When administrative controls are used, Tervo Masonry, llc. will employ the following systems and safe work practices:

- In conjunction with the Owner/Prime Contractor, suitable exposure control strategies (*both within and outside* Tervo Masonry, llc. 's *capabilities/responsibilities*) will be discussed and determined. As necessary/appropriate, supplemental (to this policy/procedure) project and task specific Exposure Control Plans will be developed.
- Suitable housekeeping, restricted work area, hygiene practices, training and supervision procedures/standards will be determined and implemented on Tervo Masonry, llc. projects.
- As appropriate, barriers will be erected around known silica dust generating activities, and/or warning signs will be posted.
- As able, work activities will be scheduled to minimize the silica related effect on, and from, others.

**Personal Protective Equipment Controls:** When used in conjunction with the other (*i.e. Engineering and Administrative*) controls elsewhere identified, personal protective equipment and clothing can help further reduce our employee's exposure to silica dust. In addition, protective clothing (*i.e. disposable/washable coveralls*) may be used and/or required to help prevent the contamination of the worker's personnel clothing.

## Education and Training

**Education and Training:** Prior to performing activities, or working on project sites where personnel could be exposed to silica dust, Tervo Masonry, llc. will ensure that personnel receive suitable education and training. As necessary, personnel will be trained to a level of "demonstrated competency". While not necessarily an exhaustive list, education and training may include:

- The hazards and risks associated with exposure to silica dust.
- The signs and symptoms of silica related diseases.
- General and specific silica exposure reduction methods/strategies (*i.e. as detailed in the general/specific exposure control plans*).
- The use of specific pieces of equipment and control systems (*i.e. LEV and WDS systems*).
- The use and care of respiratory (and other) personal protective equipment.
- How to seek first aid (*i.e. for respiratory related concerns, including those that may be caused/associated with silica dust exposure*), and

## Tervo Masonry, llc

- How to report items of the concern (*i.e. those related to silica dust*).

The education and training detailed will be delivered to Tervo Masonry, llc. employees through a variety of forums, including but not necessarily limited to:

- New Employee Orientations.
- Project/Site Orientations.
- Equipment/task specific training (*in accordance with Tervo Masonry, llc.'s Policy, all personnel must be trained to a level of "demonstrated competency" prior to using required tools, equipment and appliances*).
- Start of shift "tool box talks".
- Regularly scheduled crew "Tailgate Meetings".
- Notifications and Bulletins (*those developed in house and those acquired from other reputable sources*).

## **Safe Work Procedures**

Tervo Masonry, llc. will ensure that suitable written procedures for controlling the risk of silica exposure are developed. This document/table summarizes the silica control options generally available on Tervo Masonry, llc. sites/projects, and will be complimented with project/tasks specific Exposure Control Plans as necessary. This document and any supplemental work procedures/ECPs will be made readily available for review by all affected workers.