

SILICA EXPOSURE CONTROL

Purpose

The purpose of the silica exposure control plan (ECP) is to set out the Pulsar Helium (the company) minimum expectations for protecting workers from harmful exposure to respirable crystalline silica on all company owned and operated sites.

Scope

This program represents the minimum requirements of workers while engaged in work on behalf of the company. When work is performed by a contractor on a company site, the contractor's program shall take precedence. However, this program may be adopted for use by contractors who do not have a formal Silica Exposure Control Program.

Key Responsibilities

Due to the significant risk posed by respirable crystalline silica, it is critical that all personnel involved in operations that could potentially create silica dust take specific action to ensure that, as much as possible, a hazard is not created.

Contractors:

- Substitution of less hazardous products for those that contain crystalline silica whenever possible.
- Ensuring that the materials (e.g., tools, equipment, personal protective equipment) and other resources (i.e., worker training materials) required to fully implement and maintain this exposure control plan (ECP) are readily available where and when they are required. An ECP auto form is available at the Pulsar Helium Office.
- Providing a job-specific Exposure Control Plan (ECP) for each project, which outlines in detail the work methods and practices that will be followed on each site. Considerations will include:
 - Availability and delivery of all required tools/equipment
 - Scope and nature of work to be conducted
 - Control methods to be used and level of respiratory protection required
 - Coordination plan
- Conducting a periodic review of the effectiveness of the ECP. This would include a review of the available dust-control technologies to ensure these are selected and used when practical.
- Initiating sampling of worker exposure to concrete dust when there are non-standard work practices for which the control methods to be used have not been proven to be adequately protective.
- Ensuring that all required tools, equipment, and personal protective equipment are readily available and used as required by the ECP.
- Ensuring supervisors and workers are educated and trained to an acceptable level of competency.
- Maintaining records of training, fit-test results, crew talks, and inspections (equipment, PPE, work methods/practices).
- Coordinating the work with the company representative to ensure a safe work environment.
- Ensuring that a copy of the written exposure control plan is available to all affected employees. The written exposure control plan must be available for examination and copying by each employee. Copies may be available electronically or physically, depending on location needs and requirements.

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Contractor Supervisors:

- Ensure the contractor has made a copy of the ECP available at the worksite.
- Selecting, implementing, and documenting the appropriate site-specific control measures.
- Providing adequate instruction to workers on the hazards of working with silica-containing materials (e.g., concrete and blasting media) and on the precautions specified in the job-specific plan covering hazards at the location.
- Ensuring that workers are using the proper respirators and have been fit-tested, and that the results are recorded.
- Directing the work in a manner that ensures the risk to workers is minimized and adequately controlled.
- Communicating with the prime contractor and other sub-contractors to ensure a safe work environment.

Workers:

- Knowing the hazards of silica dust exposure
- Using the assigned protective equipment in an effective and safe manner
- Setting up the operation in accordance with the site-specific plan
- Following established work procedures as directed by the supervisor
- Reporting any unsafe conditions or acts to the supervisor
- Knowing how and when to report exposure incidents

Crystalline Silica Properties

Crystalline silica is a common mineral found in many naturally occurring materials and used in many industrial products and at construction sites. Materials like sand, concrete, stone and mortar contain crystalline silica. Crystalline silica is also used to make products such as glass, pottery, ceramics, bricks, concrete and artificial stone. Industrial sand used in certain operations, such as sand blasting and hydraulic fracturing (fracking), is also a source of crystalline silica exposure. Amorphous silica, such as silica gel, is not crystalline silica.

Inhaling very small ("respirable") crystalline silica particles, causes multiple diseases, including silicosis, an incurable lung disease that can lead to disability and death. Respirable crystalline silica also causes lung cancer, chronic obstructive pulmonary disease (COPD), and kidney disease.

List of Tasks That Expose Employees to Respirable Crystalline Silica

A list or description of tasks in the workplace that expose employees to respirable crystalline silica must be in place. Tasks include activities like those listed below and anything else that is likely to expose employees to respirable crystalline silica:

- Sawing
- Drilling
- Grinding
- Abrasive blasting (e.g., of concrete structures)
- Jackhammering, chipping, or drilling rock or concrete
- Cutting brick or tiles
- Sawing or grinding concrete
- Tuck point grinding
- Road construction
- Loading, hauling, and dumping gravel

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- Demolition of structures containing concrete
- Sweeping concrete dust
- Fracking

The list of tasks shall be included in the job hazard assessment or any other form of prework hazard assessment.

Health Hazards

Exposure to respirable crystalline silica has been shown to cause silicosis, lung cancer, pulmonary tuberculosis, and other airway diseases. Crystalline silica dust can cause 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 symptoms of the disease may not appear for many years.

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

- Chronic silicosis—develops after 10 or more years of exposure to crystalline silica at relatively low concentrations
- Accelerated silicosis—develops 5 to 10 years after initial exposure to crystalline silica at high concentrations
- Acute silicosis—develops within a few weeks, or 4 to 5 years, after exposure to very high concentrations of crystalline silica

Initially, workers with silicosis may have no symptoms; however, as the disease progresses, a worker 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.

Exposure Assessments

Exposure assessments must be conducted for those employees who are expected to be exposed to respirable crystalline silica at or above the action level. The exposure of each employee who is or is expected to be exposed to respirable crystalline silica at or above the action level (8-hour TWA of $25\mu\text{g}/\text{m}^3$) must be assessed. This assessment can be performed by monitoring employees individually or taking a representative sample from employees.

The key step in developing a silica exposure control plan is to identify the work activities that would put workers at risk of exposure.

- Work activities — that may generate airborne silica dust—for silica, the route of exposure is through the inhalation of airborne dust. The employer should have a qualified person review the planned work activities to identify those that may generate airborne silica.
- Identify workers at risk of exposure.
- Amount of exposure—some work activities generate more dust than others, and the amount of exposure should be estimated. Published resources are available that provide air sampling data and compare silica dust levels from various construction activities.

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- Duration of exposure—Workers who grind concrete for a full shift would be at greater risk than workers jackhammering for an hour.

Engineering and Work Practice Controls

Engineering and work practice controls shall be used to reduce and maintain employee exposure to respirable crystalline silica to the lowest feasible level and maintain it at that level when required.

The following hierarchy of control measures must be followed:

- Elimination/substitution (e.g., using products with less silica or using work methods that would eliminate the need for surface grinding)
- Engineering controls (e.g., water, local exhaust ventilation, enclosure)
- Administrative controls (e.g., coordination of tasks with subcontractors, signage)
- The use of proper PPE such as gloves, coveralls and eye protection when exposed to silica. Personal protective equipment such as gloves, coveralls and eye protection will be used to control silica exposures.

Contractors must commit to developing knowledge and expertise about these controls, and to establishing policies/procedures to protect workers from harmful exposure and to minimize reliance on respirators. Effective engineering controls such as HEPA vacuum attachments and wetting methods, which control silica dust at its source should be readily available. These controls have been proven to reduce airborne dust levels significantly when selected and operated in accordance with best practices. We know that engineering controls alone do not reduce airborne silica to safe levels, so in most cases other control measures including respiratory protection will be necessary.

If a contractor takes on a job that could release an unusually high amount of dust, and they are unsure of the adequacy of their control measures, there will be air sampling conducted to ensure that control methods are protective.

Contractors will reduce or eliminate worker exposure to silica dust by selecting a combination of the following listed controls in order of preference:

- Elimination and substitution - Engineering
- Administrative - Personal protective equipment

Elimination and Substitution

The importance of planning the work to minimize the amount of silica dust generated must be recognized. During the project planning phase, workers will advocate for the use of methods that reduce the need for cutting, grinding, or drilling of concrete surfaces (e.g., formwork planning). Whenever possible, supervisors will schedule work when concrete is still wet, because it is known that much less dust is released at that time.

Engineering Control of Dust

Selecting an appropriate control measure depends on the specifics of the operation. In some cases, local exhaust ventilation (LEV) is more effective at controlling exposure (e.g., during grinding operations) than wetting methods. In a different application, wetting may be more effective (e.g., during cutting operations) than LEV. However, using LEV may reduce the amount of final cleaning required, as the silica dust is captured.

A dust control system may employ three well-established techniques:

- Local exhaust ventilation (LEV)
- Wet dust suppression (WDS)
- Restricting or isolating the work activity with barriers or full enclosures (this may be the only option where LEV or WDS is not practical or effective)

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Local Exhaust Ventilation (LEV)

When LEV is used, workers will employ the following systems and safe work practices:

- Vacuum attachment systems to capture and control the dust at its source whenever possible.
- Dust control systems (used regularly and well maintained).
- Grinding wheels operated at the manufacturers' recommended rpm (operating more than this can generate significantly higher airborne dust levels).
- Retrofit shrouds or exhaust cowlings for corner grinding; use manufacturer-specified rpm speeds and a well-maintained HEPA vacuum.
- Diamond stone grinders, which allow for the use of a more efficient suction casing on the grinder, whenever practicable.
- HEPA or good quality, multi-stage vacuum units approved for use with silica dust.
- Work planning, so that concrete grinding can be completed when wet (dust release can be significantly reduced).
- Train workers and supervisors on how to properly use and maintain the equipment.

Wet methods for Dust Control

When water spray systems are used, workers will follow these safe work practices:

- Pneumatic grinders will be used instead of electric-powered grinders if water is the method of control.
- Pressure and flow rate of water will be controlled in accordance with tool manufacturers' specifications.
- When sawing concrete or masonry, workers will use only saws that provide water to the blade.
- Wet slurry will be cleaned from work surfaces when the work is completed, using a wet vacuum or wet sweeping.

Barriers and Enclosures - When barriers or enclosures are used, the site foreman will determine the type and design of barrier or enclosure (based on the work activity and the work area) and ensure it is constructed in accordance with the work plan. Barriers may be simple hazard-flagging ribbon or more restrictive barriers.

Administrative Controls

Workers will follow these safe work practices:

- Exposure control plans and the site risk assessment/work plan will be completed prior to the start of work.
- Housekeeping Measures Put in Place to Limit Employee Exposure to Respirable Crystalline Silica – A description of housekeeping measures used to limit exposure to respirable crystalline silica must be in place (and included in the Job Safety Analysis). This can include vacuuming, sweeping, wetting and other techniques used to limit the amount of respirable crystalline silica exposure during housekeeping activities. Vacuums with high-efficiency particulate air (HEPA) filters are required.
- Procedures for housekeeping must be established, restricting work areas, personal hygiene, worker training, and supervision.
- As part of project planning, workers will assess when silica dust may be generated and plan to eliminate or control the dust at the source. It is recognized that awareness and planning are key factors in the prevention of silicosis.
- Warning signs will be posted to warn workers about the hazards of silica and to specify any protective equipment required (for example, respirators).
- Work schedules will be posted at the boundaries of work areas contaminated with silica dust.
- When possible, work that generates silica dust will be conducted after hours, when access to other unprotected workers cannot be restricted.
- Workers will develop a site-specific exposure control plan to cover project-specific issues (e.g., scope of work, project location and site-specific hazards) and must be readily available at the worksite.

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Personal Protective Equipment

Respiratory Protection

- When required, respirators must be provided to employees that are exposed to respirable crystalline silica.
- Respirators must be provided to employees who are or will be exposed to actionable levels of respirable crystalline silica. If an employee is performing a task listed in Table 1 of 1926.1153 (c) that does not require the use of a respirator then they are not required. All other tasks not covered by Table 1 must be accounted for by providing respirators if necessary.
- Link for Table 1 [https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=1270#1926.1153\(c\)](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=1270#1926.1153(c))
- All workers who wear respirators will do so in adherence with their company respiratory protection program.
- Respirators must be selected based upon measured exposure levels and the assigned protection factor of respirators.
- Only approved respirators will be used.
- Filtering face piece respirators give little or no protection to workers with beards, and even a minor growth of stubble can severely reduce the effectiveness of respiratory protection.
- All workers who wear respirators will be fit-tested.
- Workers will be properly trained in the use of respirators, and a high standard of supervision, inspection, and maintenance will be followed.

Protective clothing

The workers employer will provide workers in a restricted area with protective clothing that protects other clothing worn by the worker from silica contamination, ensure that silica does not contaminate workers' street clothing, and ensure that a worker does not leave a restricted area until the worker has been decontaminated.

Documentation

Records must be kept of the following:

- All workers who are exposed to respirable silica dust while on the job
- Worker education and training sessions
- Respirator fit-testing
- Equipment maintenance and repair
- Worksite inspections
- Medical surveillance when required

Annual Assessment

The written program's effectiveness must be reviewed at least annually. Situations where reevaluation may be necessary include regulatory updates, changes in equipment and exposure incidents.

Medical Surveillance

A medical surveillance program for all employees whose exposure is equal to or exceeds the action level for 30 or more days per year is required. A medical surveillance program must be established for employees who are exposed to the action level of 8-hour TWA of $25\mu\text{g}/\text{m}^3$ of respirable crystalline silica. A baseline medical assessment must be available to exposed employees within 30 days of initial assignment unless they have previously received a suitable medical examination in the past three years. This applies to employees who would be required to wear a respirator more than 30 days per year or who are exposed to action level respirable crystalline silica for more than 30 days per year. A suitable prescreen that meets the same requirements is also acceptable.

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The basics of the medical examination include:

The employer must bear the cost for the employee to use a qualified health care professional to conduct an exam, and obtain a written medical opinion which is shared with the employee's employer. This written opinion needs to contain:

- The date of the exam
- A statement that the exam has specifically checked for silica exposure per the requirements of the standard.
- Any recommended limitations on the employee's exposure to respirable crystalline silica as a result of the exam's findings

The employee may learn other medical information from his or her physician during the visit, but this is private and not required to be shared with the employer.

The exam conducted by the qualified health care provider must include the following:

- A review of the patient's medical and work history.
- A physical examination with special emphasis on the respiratory system.
- A chest x-rays.
- A pulmonary function test administered by a certified spirometry.
- Testing for latent tuberculosis.
- Any other tests deemed appropriate by the health care provider.

Information required to be given to the health care provider:

- A copy of the OSHA respirable crystalline silica rule.
- Construction Standard - <https://www.osha.gov/silica/SilicaConstructionRegText.pdf>
- Construction Medical - <https://www.osha.gov/silica/AppendixBtosect1926.1153.pdf>
- General Industry Standard <https://www.osha.gov/silica/SilicaGeneralIndustryRegText.pdf>
- General Industry Medical <https://www.osha.gov/silica/AppendixBtosect1910.1053.pdf>
- 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.
- Information from records of employment-related medical examinations previously provided to the employee and currently within the control of the employer.

Records

Accurate records of all air monitoring data, objective data, and medical surveillance shall be maintained as required by the regulation.

Training

A training program shall be provided for all employees who are exposed to action level respirable crystalline silica. The training shall ensure that employees covered by the written exposure control plan can demonstrate knowledge and understanding of the health hazards associated with respirable crystalline silica, the specific tasks in the workplace that could result in exposure to respirable crystalline silica, the specific measures taken to protect employees from exposure to crystalline silica, the contents of the respirable crystalline silica rule, and the purpose of the medical surveillance program.

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Pulsar Helium
Safety Management System

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CONTROL PLAN

Date control plan completed:			
Prime contractor:		Superintendent:	
Project manager:		CSO/First aid attendant:	
Project:	Address:		
Company completing work:			
Address:		Contact:	
Contact phone:		Contact fax:	
On-site supervisor(s):			
Worker(s):			
Scope of work to be completed:			
Work start date:		Duration: ☐ Days ☐ Months ☐ Years	
Employer responsible for:			
Supervisor responsible for:			
Worker responsible for:			
HAZARDS IDENTIFIED (other than silica)		CONTROL MEASURE(S)	
☐ Falls			
☐ Slipping			
☐ Confined space			
☐ Workers above			
☐ Workers below			
☐ Noise			
☐ Electrical			
Overview of work procedure (How are you going to work safely?):			
Workers trained in (training records must be available for review):			
Proper use of grinding equipment	Y ☐ N ☐	Proper use of admin controls	Y ☐ N ☐
Proper use of engineering controls	Y ☐ N ☐	Proper use of PPE	Y ☐ N ☐
Proper disposal methods	Y ☐ N ☐	Other (fall protection, swing stages, etc.)	Y ☐ N ☐

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Cleanup		
Vacuum used properly	Y ☐ N ☐	
Large pieces picked up	Y ☐ N ☐	
Vacuum capacity maintained	Y ☐ N ☐	
Pre-filters in place	Y ☐ N ☐	
Vacuum attachments used	Y ☐ N ☐	
Collection bags in place	Y ☐ N ☐	
Waste properly disposed of	Y ☐ N ☐	

TABLE 1 (Codes for task/risk management matrix)

Engineering controls		Administrative controls		PPE		Supplies/Equipment	
1	Exhaust fan	1	Signage	1	Respirator	1	Hand grinder
2	LEV	2	After hours work	2	Gloves	2	Ceiling grinder
3	Wetting	3	Scheduling	3	Coveralls	3	Floor grinder
4	Partial enclosure			4	Hearing protection	4	Disposal bags
5	Full enclosure			5	Eye protection	5	HEPA filter (vacuum)
6	Shroud			6	Reflective vest	6	HEPA filter (respirator)
7	Barriers			7	Rubber boots (CSA)	7	Shovel
				8	Fall arrest	8	Lifeline



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SITE-SPECIFIC SILICA EXPOSURE CONTROL PLAN

Location: _____ Date: _____

Work description:

Primary silica control options (check those options used and explain use if needed)

- ◆ Substitution controls (using procedures or products that do not create silica; must review MSDSs)

Other means of demo: _____
Different products: _____
Other substitutions: _____

- ◆ Engineering controls (when using ventilation, draw air out and don't expose others to exhaust dusts)

Vacuuming: _____
Wetting: _____
Ventilation: _____
Isolation: _____
Other means: _____

- ◆ Administration controls (reducing exposure by work schedules, timing, or planning options)

Control points: _____
Work schedule: _____
Other means: _____

Secondary silica control options (check those options used and explain use if needed)

- ◆ Personal protective equipment

Half-mask
respirators: _____ Cartridge type: _____ Fit tests confirmed: _____
Full-face respirators: _____ Cartridge type: _____ Fit tests confirmed: _____
Supplied air units: _____
Coveralls required: _____

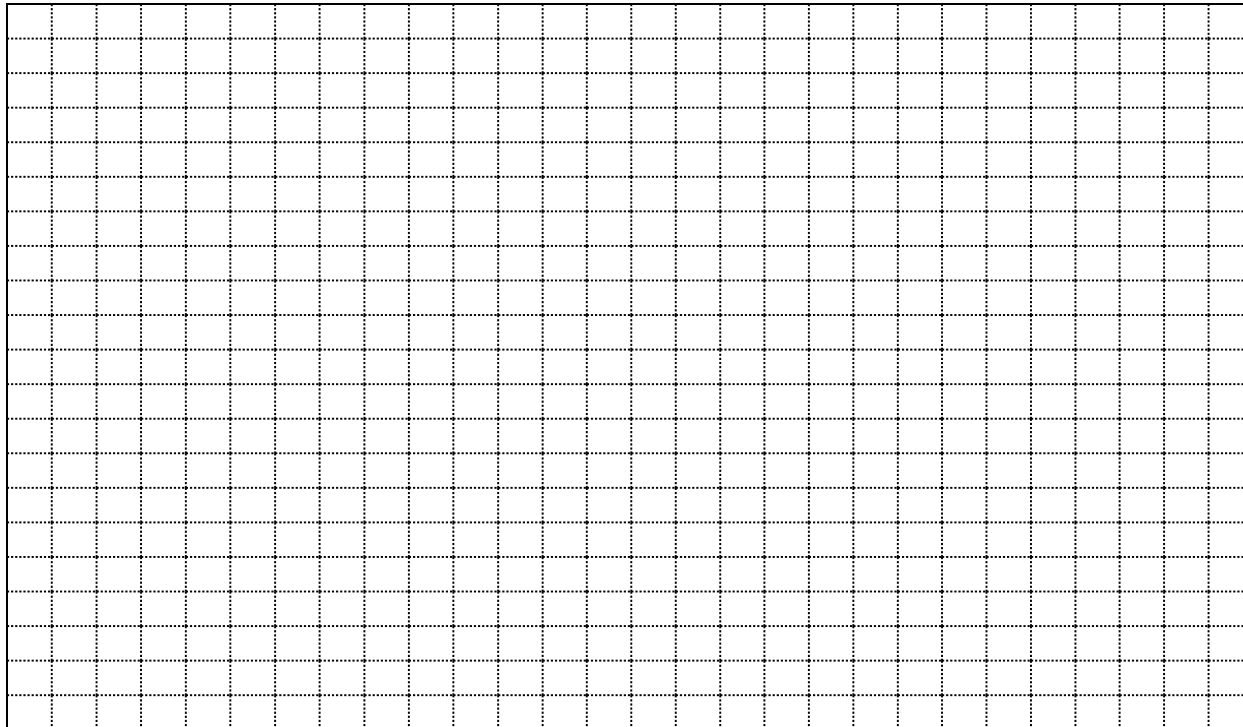
- ◆ Hygiene and decontamination options (reducing exposures after work has stopped or during breaks)

Water or washing facilities on site: _____
Vacuuming clothing/self: _____

Safe work procedures and other
details: _____

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Ventilation plan (sketch)



← Show direction of airflow including makeup air locations and discharge air outlets

Area or location in building of ventilation plan (e.g., floor #, wing)

Date plan was reviewed by workers and posted for workers to see

Types of neg. air fans & no.'s *

* Indicate on plan by number the location of the negative air fans

Ventilation safety checklist

- | | |
|--|--|
| ☐ Makeup air free of possible contaminants | ☐ Workers not placed between contaminants created and exhaust inlet ports |
| ☐ Exhaust fan operation has failure warning | ☐ Discharge air not affecting others |
| ☐ Dilution fans not stirring up dust | ☐ All workers equipped with approved respirators |
| ☐ Wetting of materials used to keep dust down | |

Note: Attach additional sheets if needed or other documents if required due to hazards or work conditions.

Print supervisor's name

Supervisor's signature

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