



# ENVIRONMENTAL HEALTH AND SAFETY

## SILICA CONTROL PROGRAM MANUAL

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# Status

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# A: INTRODUCTION

Crystalline silica (silicon dioxide, SiO<sub>2</sub>) is a common mineral found in many naturally occurring and man-made materials. There are three forms of silica: quartz (which is the most common), cristobalite, and tridymite. Silica is found in the earth's crust, and it is a component of soil, sand, stone, rock, concrete, brick, block, mortar, and plaster. Additionally, it can also be found in materials like paints, joint compound, drywall, ceiling tiles, ceramic tiles, and grout.

Respirable crystalline silica is made of very small particles, typically 100 times smaller than ordinary sand found at beaches. At this size, the particles can enter your lungs and cause disease. Respirable-sized particles are generated during job tasks such as sawing, cutting, grinding, drilling, excavating, and/or crushing silica-containing materials, or when abrasive blasting with silica-containing materials or on substrates that contain silica.

There are known health effects from exposure to respirable crystalline silica. The most common is silicosis, an incurable disease where silica has caused scarring in the lungs, making them less flexible and less able to absorb oxygen. Silicosis can be acute (marked by high intense exposures over a short period of time), accelerated (which can develop after exposure from 5-10 years), or chronic (from long term exposure to lower levels).

Silica can also cause chronic obstructive pulmonary disease (COPD), including chronic bronchitis, emphysema, and chronic airway obstruction. It can make you more susceptible to tuberculosis. There are also non-respiratory diseases associated with silica exposure, including kidney disease and autoimmune disorders, such as scleroderma, lupus, and rheumatoid arthritis.

To prevent unnecessary injuries or the loss of life, OSHA enacted the Respirable Crystalline Silica standard for construction (29 CFR 1926.1153), effective June 23, 2018. The standard requires that protective measures be taken when workers are exposed to concentrations of respirable crystalline silica at or above 25 micrograms per cubic meter of air (25 µg/m<sup>3</sup>) as an 8-hour time-weighted average (TWA) under any foreseeable conditions.

## **PROGRAM GOALS**

Oklahoma State University's (OSU) number one goal is to not generate any silica-containing dusts above the permissible exposure limit (PEL). This allows us to ensure that no one is exposed above acceptable, safe levels – not the worker performing the task, nor faculty, staff, or students passing by the work area. It also reduces our compliance needs to a few easily manageable tasks.

Whenever possible, silica hazards will be eliminated from the workplace by engineering, work practice, or administrative controls. Only if this is not possible or those controls do not provide enough protection will Oklahoma State University use personal protective equipment (PPE).

This document outlines the hazards associated with silica dust and the steps to take to ensure faculty, staff, and students who work around silica are not exposed to hazardous levels of silica dust.

## **PROGRAM APPLICATION**

This program applies to all faculty, staff, students, contractors, or subcontractors whose activities could generate silica-containing dust and is working in or on Oklahoma State University-owned or operated properties.

## OSHA REQUIREMENTS

Oklahoma State University is required to establish and implement a written Silica Exposure Control Plan (SECP) that contains at least the following elements:

- A description of the tasks in the workplace that involve exposure to respirable crystalline silica;
- A description of the engineering controls, work practices, and respiratory protection used to limit employee exposure to respirable crystalline silica for each task; and
- A description of the housekeeping measures used to limit employee exposure to respirable crystalline silica.
- A description of the procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to respirable crystalline silica and their level of exposure, including exposures generated by other employers or sole proprietors.

Oklahoma State University will review and evaluate the effectiveness of the written exposure control plan at least annually and update it as necessary. It will also make the written exposure control plan readily available for examination and copying, upon request, to employees, their designated representatives, and OSHA representatives. A tool to create Silica Exposure Control Plan can be found [here](#).

## B: ADMINISTRATIVE ROLES

### ENVIRONMENTAL HEALTH AND SAFETY

The specific responsibility for developing and implementing OSU programs for health and safety resides with the Environmental Health and Safety (EHS) Department. In fulfillment of this responsibility, EHS has prepared the Oklahoma State University Silica Control Program and assists other departments in the development and implementation of silica control for their areas. Specific duties include:

- Provide information on silica management;
- Conduct silica awareness training;
- Ensure adherence to OSHA's Table 1, which is located in the Environmental Health and Safety Silica Exposure Control Plan for reference;
- Provide departments with expertise and guidance on adhering to regulatory requirements and university policy;
- Recommend appropriate response actions to control or eliminate potential hazards;
- Audit projects as necessary;
- Communicate with regulatory agencies, as needed, as well as with the university community at large;
- Help campus groups Develop and maintain a departmental Silica Exposure Control Plan;
- Conduct screenings for employee exposure determinations;
- Coordinate with exposed employees to schedule consultants which provide employee exposure assessments;
- Develop and maintain the Respirator Program, including respirator training and fit testing; and
- Maintain records as required.

### FACILITIES MANAGEMENT

Facilities Management (FM) is a key partner in identifying projects likely to generate respirable crystalline silica at OSU. FM supervisors are responsible for ensuring their employees are properly trained to do the jobs they are sent to do. **No FM employee shall be sent on a job that potentially involves work generating respirable crystalline silica (RCS) unless they have been properly trained.**

## DEPARTMENTS

Departments will identify potential exposures in their areas and are responsible for the implementation of the components of this Silica Control Program, including:

- Identify a competent person(s) for respirable crystalline silica;
- Schedule silica training for employees as necessary;
- Notify EHS in cases of uncontrolled releases of visible dust in occupied buildings;
- Provide engineering and work practice controls as identified in Table 1, or alternative controls, as needed;
- Apply for a construction permit if performing work will disturb silica containing materials;
- Request employee exposure assessments when necessary, scheduled with EHS;
- Schedule medical surveillance for affected employees, initially and then every 3 years, unless sooner as identified by the OSHA Standard;
- Arrange for medical evaluation for respirator use, in accordance with the University's Respirator Program; and
- Schedule employees for respirator training and fit testing annually.

## DEPARTMENTS USING OUTSIDE TRADE CONTRACTORS

- Ensure contractor is aware of OSHA's Silica in Construction standard;
- Ensure contractor have their own Silica Exposure Control Plan;
- Apply for a construction permit if performing work will disturb silica containing materials;
- Direct contractor to use the proper equipment; and
- If suitable air quality cannot be achieved, work should be scheduled outside of normal working hours.

## PROGRAM REVIEW

EHS will review the Silica Control Program for Construction annually. If revisions are needed, the changes will be made, and employees trained on the revisions.

# C: IDENTIFICATION AND EVALUATION

## SOURCES OF SILICA EXPOSURE

Crystalline silica occurs naturally and is a basic component of sand, concrete, brick, asphalt, granite, some blasting abrasives, and some wall spackling materials. Employees can be exposed to silica from activities such as:

- Abrasive blasting
- Jack hammering
- Concrete crushing
- Rock breaking (e.g., using hoe rams)
- Rock drilling
- Mixing of concrete or grout
- Concrete drilling
- Sawing concrete or bricks
- Chipping or scarifying concrete
- Rock crushing
- Moving or dumping piles of concrete, rock or sand
- Demolition of concrete or brick
- Using coatings containing silica
- Removing coatings containing silica
- Dry sweeping of such debris
- Cutting sheetrock

Other "non-construction" activities like carving stone, foundry/metal casting, porcelain enameling, or throwing pottery can have significant levels of silica exposure.

## **ASSESSMENT**

Any time silica-containing materials are used, the potential for silica exposure must be assessed before work begins. EHS can help perform building material assessments to determine silica content in materials.

If airborne silica could be generated during the project, dust control methods from Table 1 must be used to bring the exposure level below the action level (25  $\mu\text{g}/\text{m}^3$ ). EHS can conduct exposure monitoring to determine exposure level and recommend additional safety precautions that can minimize exposure to airborne silica dust. Contact EHS (ohsp@okstate.edu) to request exposure monitoring.

## **SAMPLING**

If exposures above the action level are suspected, personal exposure monitoring will be conducted using an approved NIOSH or OSHA method.

EHS will notify the department/supervisor of the exposure monitoring results as soon as the final laboratory analysis is received. The department/supervisor must provide this information to the affected employee(s) within 5 working days.

If sampling reveals exposures >permissible exposure level (50  $\mu\text{g}/\text{m}^3$ ), steps will be taken immediately to reduce the exposure to below the PEL, and the personal exposure monitoring will be performed again using an approved NIOSH or OSHA method.

# **D: CONTROL METHODS**

## **CONTROLLING EXPOSURES**

In addition to protecting employees working with silica-containing materials, building occupants, staff, students, and the public must be protected from the generation of silica dust. Visible dust must not leave the worksite where it might expose passersby. Outdoors engineering controls (wet cutting or HEPA vacuum) and barricades/tape sufficiently distant from the work should be enough to protect passersby.

Indoors, additional measures may be necessary to protect building occupants. First, building occupants must be notified of projects. Scheduling projects outside of normal working hours when an area is less occupied is advisable. Barrier tape or plastic sheeting must be used to separate the worksite from the rest of the building. Signs must be posted at the entrance to the worksite to prevent access.

If engineering controls and work practice controls are not sufficient to eliminate visible dust or are not feasible, exhaust ventilation must be utilized in the space to reduce exposures and prevent migration of dust outside the workspace. Should visible airborne silica dust be generated at the worksite, or if airborne silica exposures are above the PEL, the area must be considered a regulated area and respiratory protection will be mandated for anyone entering the space.

Abrasive blasting with silica-containing materials cannot be made safe. This type of blasting shall be avoided unless absolutely necessary. Alternate blasting methods (dry ice, walnut shells, etc.) shall be used.

If abrasive blasting with silica-containing materials is absolutely unavoidable, then employees performing the blasting must use appropriate PPE, and the abrasive blasting will be conducted in an enclosure- similar to the enclosures built for asbestos abatement-to contain the dust to the blasting area.



### **SPECIFIC CONTROL METHODS**

For each university employee working with materials containing crystalline silica, Oklahoma State University will fully and properly implement the engineering controls, work practices, and respiratory protection specified. OSHA has a list of tasks and equipment they have already approved (listed below). Tasks/equipment not on this list will have to be evaluated; contact EHS ([ohsp@okstate.edu](mailto:ohsp@okstate.edu)) for assistance.

#### **Stationary Masonry Saws**

- Engineering control: Water continuously fed to the blade
- Respiratory protection: None required

#### **Drivable Saws**

- Engineering control: Water continuously fed to the blade
- Respiratory protection:
  - Enclosed Area: Cannot use saw in enclosed areas
  - Outside Area: None required

#### **Handheld Power Saws**

- Engineering control: Water continuously fed to the blade
- Respiratory protection (less than 4 hours per shift):
  - Enclosed area: N100 respirator (disposable or non-disposable)
  - Outside area: None required
- Respiratory protection (more than 4 hours per shift):
  - Enclosed area: N100 respirator (disposable or non-disposable)
  - Outside area: N100 respirator (disposable or non-disposable)

#### **Walk-Behind Saws**

- Engineering control: Water continuously fed to the blade
- Respiratory protection (less than 4 hours per shift):
  - Enclosed area: N100 respirator (disposable or non-disposable)
  - Outside area: None required
- Respiratory protection (more than 4 hours per shift):
  - Enclosed area: N100 respirator (disposable or non-disposable)
  - Outside area: None required



### **Rig-Mounted Core Saw or Drill**

- Engineering control: Water continuously fed to the cutting surface
- Respiratory protection: None required

### **Handheld and Stand-Mounted Drills**

- Engineering control: Commercial shroud or cowling with a dust collection system
- Respiratory protection: None required

### **Dowel Drilling Rigs for Concrete**

- Engineering control: Commercial shroud or cowling with a dust collection system
- Respiratory protection (less than 4 hours per shift):
  - Enclosed area: Cannot use a drill in enclosed areas
  - Outside area: N100 respirator (disposable or non-disposable)
- Respiratory protection (more than 4 hours per shift):
  - Enclosed area: Cannot use a drill in enclosed areas
  - Outside area: N100 respirator (disposable or non-disposable)

### **Vehicle-Mounted Drilling Rigs**

- Engineering control: Use a dust collection system with a 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. – OR – Operate from within an enclosed cab and use water for dust suppression on a drill bit.
- Respiratory protection: None required

### **Jackhammers and Handheld Power Chipping Tools**

- Engineering control: Water continuously fed to the point of impact. – OR – Commercial shroud or cowling with a dust collection system.
- Respiratory protection (less than 4 hours per shift):
  - Enclosed area: N100 respirator (disposable or non-disposable)
  - Outside area: None Required
- Respiratory protection (more than 4 hours per shift):
  - Enclosed area: N100 respirator (disposable or non-disposable)
  - Outside area: N100 respirator (disposable or non-disposable)

### **Walk-Behind Milling Machines and Floor Grinders**

- Engineering control: Water continuously fed to the point of impact. – OR – Commercial shroud or cowling with a dust collection system.
- Respiratory protection: None required

### **Small Drivable Milling Machines (Less than Half-Lane)**

- Engineering control: Use a machine equipped with supplemental water sprays designed to suppress dust; water must be combined with a surfactant.
- Respiratory protection: None required

### **Large Drivable Milling Machines (Half-Lane and Larger)**

- Engineering control: Use a machine equipped with exhaust ventilation on drum enclosure and supplemental water spray designed to suppress dust. – OR – Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant.
- Respiratory protection: None required

### **Crushing Machines**

- Engineering control: Use equipment designed to deliver water spray or mist at crusher and other points where dust is generated. – AND – Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station.
- Respiratory protection: None required

### **Heavy Equipment (Hoe-Ramming, Rock Ripping, and Demolition)**

- Engineering control: Operate equipment from within an enclosed cab. – AND – When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.
- Respiratory protection: None required

### **Heavy Equipment (Grading and Excavating)**

- Engineering control: Apply water and/or dust suppressants as necessary to minimized dust emissions – OR – When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.
- Respiratory protection: None required

### **Handheld Grinders for Mortar Removal**

- Engineering control: Commercial shroud or cowling with a dust collection system
- Respiratory protection (less than 4 hours per shift):
  - Enclosed area: N100 respirator (disposable or non-disposable)
  - Outside area: N100 respirator (disposable or non-disposable)
- Respiratory protection (more than 4 hours per shift):
  - Enclosed area: Full face air-purifying respirator
  - Outside area: Full face air-purifying respirator

### **Handheld Grinders for Uses Other than Mortar Removal**

- Engineering control: Water continuously fed to the grinding surface. – OR – Commercial shroud or cowling with a dust collection system.
- Respiratory protection (less than 4 hours per shift):
  - Enclosed area: None required
  - Outside area: None required
- Respiratory protection (more than 4 hours per shift):
  - Enclosed area: N100 respirator (disposable or non-disposable)
  - Outside area: None required

### **HOUSEKEEPING**

The employer shall not allow dry sweeping or dry brushing where such activity could contribute to employee exposure to respirable crystalline silica. Use of wet sweeping and HEPA-filtered vacuuming is recommended.

The employer shall not allow compressed air to be used to clean clothing or surfaces where such activity could contribute to employee exposure to respirable crystalline silica.

## **E: RESPIRATOR USE**

Any employee needing a respirator is required by OSHA to be in a Respiratory Protection Program. It is the stated goal of this program to eliminate the need for workers to wear respirators. If an activity has exposures that absolutely cannot be brought under the permissible exposure level (50 µg/m<sup>3</sup>) by any dust suppression controls then, and only then, will the employees be brought into the university's Respiratory Protection Program.

Supervisors/employees who suspect they need a respirator should contact EHS (ohsp@okstate.edu) for assistance.

## **MEDICAL SURVEILLANCE**

Employees who are exposed above the action level (25 µg/m<sup>3</sup>) for 30 or more days per year, or if they develop symptoms of silica exposure, or if they are in the university's Respiratory Protection Program will be enrolled in Oklahoma State University's Medical Surveillance Program.

## **RECORDKEEPING**

Oklahoma State University will keep the records associated with this program for at least 30 years past the date of last employment for any employee with exposures > action level (25 µg/m<sup>3</sup>).

### **Recordkeeping Responsibilities**

- Training records will be kept by the appropriate departmental personnel.
- Safety data sheets will be kept by the appropriate departmental personnel.
- Sampling records will be maintained by EHS.
- Inspection results will be maintained by EHS.
- Records of complaints will be maintained by EHS.
- Medical surveillance records will be kept by University Health Services.

## **F: ASSESSMENT**

EHS will perform a silica exposure assessment for any employee who suspects they are exposed to respirable dust above the action level (25 µg/m<sup>3</sup>). Supervisors or employees should notify EHS when they want a silica exposure assessment.

## **ENFORCEMENT**

Failure to comply with the OSHA Silica in Construction standard, especially such work that exposes passersby (faculty, staff, students, visitors), will result in the work being stopped by Environmental Health and Safety until controls can be implemented; this includes contractor/subcontractor activities.

### **Procedure**

1. EHS becomes aware of an issue;
2. EHS evaluates the situation;
  - a. If no exposures (i.e., no visible dust), then EHS takes no action;
  - b. If there are exposures (i.e., visible dust) and the work is being performed by OSU employees:
    - i. EHS directs the individual(s) to stop until corrections can be made, and contacts the supervisor to advise him/her of the situation;
    - ii. Once corrections are made, work may resume.
  - c. If the work is being performed by contractors (or subcontractors):
    - i. If no passersby are exposed but contractor/subcontractor employees are exposed, EHS contacts the OSU Project Manager and advises him/her of the situation;
    - ii. If passersby are being exposed, EHS directs the individual(s) to stop until corrections can be made, and contacts the OSU Project Manager to advise him/her of the situation;
    - iii. Once corrections are made, work may resume.

Continued or repeated violations may result in a contractor or subcontractor being removed from the job site.

## **G: DUTIES OF DESIGNATED EMPLOYEES**

Personnel should be responsible for observing all practices and procedures contained in the Silica Control Program, other general safety practices, attending designated training sessions, and reporting hazardous or unsafe conditions to their supervisor or EHS. Employees designated as Competent Persons or Affected Employees are responsible for additional duties as outlined below.

## **COMPETENT PERSONS**

- Frequently and regularly inspect job sites, materials, and equipment;
- Identify existing and foreseeable respirable crystalline silica hazards and take prompt action;
- Be familiar with the Silica in Construction Exposure Control Plan;
- Be available to employees for questions about or problems with dust controls; and
- Notify EHS when problems arise, there is a change in engineering controls and work practices, or in situations of uncontrolled releases of visible dust.

## **AFFECTED EMPLOYEES**

- Comply with federal and state regulations and university policies as advised by EHS;
- Attend silica awareness training;
- Attend Respiratory Protection Training and Fit Testing as necessary;
- Utilize the proper engineering controls and work practices;
- Wear respirators when necessary; and
- Conduct work activities in a manner that prevents uncontrolled disturbance of silica-containing materials and the generation of visible dust.

# **H: TRAINING**

OSHA requires that the employer ensure that each employee potentially exposed to silica dust can demonstrate knowledge and understanding of:

- The health hazards associated with exposure to respirable crystalline silica;
- Specific tasks in the workplace that could result in exposure to respirable crystalline silica;
- Specific measures the employer has implemented to protect employees from exposure to respirable crystalline silica, including engineering controls, work practices, and respirators to be used;
- The contents of this section; and OSHA 1926. 1153;
- The identify of the competent person designated by the employer; and
- The purpose and a description of the medical surveillance program.

Oklahoma State University will make a copy of this section readily available without cost to each employee covered by this requirement.

Training is provided by EHS. Currently, there are two training courses: 1. Silica Awareness for Employees and 2. Silica Awareness for Supervisors.

Employees who have successfully completed this training are “Authorized Persons” under the silica standard(s) per OSHA.

The employer shall include respirable crystalline silica in the Hazard Communication program to comply with the Hazard Communication standard. The employer shall ensure that each employee has access to labels on containers of crystalline silica and safety data sheets and is trained in Hazard Communication. The employer shall ensure that at least the following hazards are addressed: cancer, lung effects, immune system effects, and kidney effects.

# **I: DIRECTORY**

1202 West Farm Road, Suite 002 / (405) 744-7241

**University Health Services**

1202 West Farm Road / (405) 744-7665

**Facilities Management**

402 North Willis / (405) 744-7154

**City of Stillwater, Oklahoma**

Emergency - ambulance, fire, police / 911

## **APPENDIX A: EXPOSURE CONTROL PLAN**

OSU EHS will not approve any construction likely to generate respirable silica dust without first receiving and evaluating a written silica exposure control plan. The OSU Silica Exposure Control Plan consists of a single page form used to indicate whether construction activities will comply with controls specified in 29 CFR 1926.1153(c)(1) Table 1 or if alternative methods and monitoring will be used. The form is followed by Table 1 in both English text and Spanish with images. Additional pages should be added as needed to fully describe controls to be used.

OSU employees and contractors may submit written exposure control plans to EHS using other forms if they provide all the required information.

All control methods not specified in Table 1 and exposure monitoring strategies must be fully described by the applicant and approved by EHS. EHS may require additional information regarding exposure controls prior to approval.