

Silica Exposure Control Plan Managing: Silica Exposure for General Industry

Clemson University

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Preface

University employees have a right to a safe workplace. Federal and state law requires employers to provide their employees with working conditions that are free of known hazards.

Employers may not retaliate against employees for exercising their rights under the law. Employees have the right to raise a health and safety concern or report an injury to regulatory agencies; for more information visit the Clemson Ethics/Safety Hotline at [Ethics/Safety Hotline \(clemson.edu\)](https://www.clemson.edu/ethics/safety-hotline).

It is the policy of Clemson University (CU) to maintain a safe and healthy work environment. Department Heads, Managers, and Supervisors are responsible for the application and enforcement of CU health and safety policies and procedures.

Introduction

Crystalline silica (silicon dioxide, SiO₂) is a common mineral found in many naturally occurring and man-made materials. There are three forms of silica: quartz (the most common) cristobalite, and tridymite. Silica is found in the earth's crust, and is a component of soil, sand, stone, rock, concrete, brick, block, mortar, and plaster. Additionally, it can also be found in materials like paints, plasters, 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 - it is not just an inert dust. 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 brief 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. And there are non-respiratory diseases associated with silica exposure, including kidney disease and autoimmune disorders such as scleroderma, lupus, and rheumatoid arthritis.

Program Goals

Clemson's main goal of the Silica Exposure Control Plan for General Industry is to *not generate any silica containing dusts above the Permissible Exposure Limit*. This written exposure plan addresses OSHA's Respirable Crystalline Silica Standard for General Industry Standard (29 CFR 1910.1053). This will ensure that no one is exposed above acceptable, safe levels including the worker performing the task, or faculty, staff, or students passing by the work area. This approach will also reduce CU compliance requirements to a limited number of tasks and activities.

Whenever possible, silica hazards will be eliminated from the workplace by engineering, work practice, or administrative controls. If those controls do not provide enough protection, CU will use 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 levels of silica dust above the applicable exposure limits.

Program Application

This program applies to all Faculty, Staff, Student, or others whose activities could generate silica containing dusts and are working in or on Clemson owned and/or operated properties. This program does not apply to CU employees that are covered under the Crystalline Silica Standard for Construction Standard (29 CFR 1926.1153).

Definitions

Action level means a concentration of airborne respirable crystalline silica of 25 $\mu\text{g}/\text{m}^3$, calculated as an 8-hour TWA.

Permissible exposure limit (PEL). The employer shall ensure that no employee is exposed to an airborne concentration of respirable crystalline silica in excess of 50 $\mu\text{g}/\text{m}^3$, calculated as an 8-hour TWA.

Regulated area means an area, demarcated by the employer, where an employee's exposure to airborne concentrations of respirable crystalline silica exceeds, or can reasonably be expected to exceed, the PEL.

Employee exposure means the exposure to airborne respirable crystalline silica that would occur if the employee were not using a respirator.

High-efficiency particulate air [HEPA] filter means a filter that is at least 99.97 percent efficient in removing mono-dispersed particles of 0.3 micrometers in diameter.

OSHA Requirements

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

- (A) A description of the tasks in the workplace that involve exposure to respirable crystalline silica.
- (B) A description of the engineering controls, work practices, and respiratory protection used to limit employee exposure to respirable crystalline silica for each task; and
- (C) A description of the housekeeping measures used to limit employee exposure to respirable crystalline silica.

Clemson will review and evaluate the effectiveness of the written exposure control plan at least annually and update it as necessary, will make the written exposure control plan readily available for examination and copying, upon request, to employees, their designated representatives, and OSHA representatives.

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 and students can be exposed to silica from activities such as, but not limited to the following:

Construction Like Activities:

- 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

Non-Construction Activities:

- Carving stone
- Foundry/hydraulic fracturing
- Metal casting
- Porcelain enameling
- Manufacturing of glass
- Manufacturing of pottery
- Restoration of artifacts

Controlling Exposures

Where Clemson University employee or student exposure to respirable crystalline silica is above the PEL, Clemson University will implement the hierarchy of controls to reduce and maintain exposure to respirable crystalline silica at or below the PEL. Exposure will first be reduced through engineering controls and then through administrative controls. When all feasible engineering and administrative controls that can be implemented prove insufficient to reduce employee exposure to or below the PEL, Clemson University will implement those controls to reduce employee exposure to the lowest feasible level and shall supplement them with the use of respiratory protection.

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 be contained to the worksite to prevent potential exposure to others that may be passing by the work area.

Outdoors, engineering controls such as wet cutting, HEPA vacuum, and/or control of work zones through the use of barricades should be implemented to protect others that may be in the vicinity.

Indoors, additional measures may be necessary to protect building occupants. Building occupants will be notified of projects. Scheduling project outside of normal working hours when area is less occupied is recommended when feasible. 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 by other employees.

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.

Establishing and demarcating areas 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.

Regulated areas will be demarcated from the rest of the workplace in a manner that decreases the number of employees exposed to respirable crystalline silica within the regulated area. Cones, stanchions, tape, barriers, lines, or textured flooring are some of the ways of marking the boundaries of regulated areas. Additionally, access to regulated areas shall be limited to authorized persons. Each entrance to a regulated area will have a posted sign that reads:

DANGER: Respirable Crystalline Silica Can Cause Cancer or Silicosis (Damage to the Lungs).

Avoid Breathing Dust. Wear Respiratory Protection in This Area. Authorized Personnel Only.

Each employee or student entering a regulated area will be provided with an appropriate respirator, equipped with a HEPA filter, which must be worn while in the regulated area.

Abrasive blasting with silica containing materials will not be conducted. Alternate blasting methods (dry ice, walnut shells, etc.) shall be used.

Sampling and Assessment

Any time silica containing materials will be used or disturbed the potential exposure to silica must be assessed before work begins. OES can help perform building material assessments to determine silica content in materials. OES will utilize a combination of exposure monitoring and, where present and applicable, objective data to determine the 8-hour TWA exposure for each employee. To be applicable, data must reflect workplace conditions closely resembling or with a higher exposure potential than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

If airborne silica could be generated during the project, dust control methods must be used to bring the exposure level below the PEL.

OES can conduct exposure monitoring to determine exposure level and recommend additional safety precautions that can minimize exposure to airborne silica dust. Personal exposure monitoring will be conducted using approved NIOSH or OSHA methods. Supervisors or employees should contact OES (OEShelp@clemsun.edu) to request exposure monitoring.

OES will notify the department/supervisor of the exposure monitoring results as within one day after the laboratory analysis is received and reviewed. The department/supervisor must provide this information to the affected employee(s) within 5 workdays.

Monitoring will be repeated at a frequency dependent on the results of exposure monitoring.

Results	Initial	Frequency of Monitoring
X>PEL	N/A	Repeat every 3 months
AL<X>PEL	N/A	Repeat every 6 months
X<AL	No	Discontinue after 2 consecutive results below the AL taken at least 7 days apart
X< AL	Yes	Discontinue Monitoring

If sampling reveals exposures exceed the PEL, steps will be taken immediately to reduce the exposure to below the PEL.

Enforcement

Failure to comply with the CU Exposure Control Plan for General Industry, especially such work that exposes passers-by (Faculty, Staff, Students, Visitors), will result in the work being stopped by OES until controls can be implemented; this includes contractor/sub-contractor activities.

Procedure

- 1) OES becomes aware of a potential occupational silica exposure.
- 2) OES evaluates the situation.
 - a. If no exposures (i.e., no visible dust), then OES takes no action.

- b. If there are exposures (i.e., visible dust) and the work is being performed by CU employees/students:
 - i. OES 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 there are exposures (i.e., visible dust) and the work is being performed by Contractors (or sub-contractors):
 - i. If no passers-by are exposed but contractor/sub-contractor employees are exposed, OES contacts the CU Project Manager and advises him/her of the situation.
 - ii. If passers-by are being exposed, OES directs the individual(s) to stop until corrections can be made and contacts the CU Project Manager to advise him/her of the situation.
 - iii. Once corrections are made, work may resume.

Specified Control Methods

For each University employee working with materials containing crystalline silica, Clemson will fully and properly implement the engineering controls, work practices, and respiratory protection as specified.

OES will conduct an assessment to evaluate the potential exposure to university staff, faculty, and students. CU will utilize methods to reduce exposure by using the following types of dust controls:

- Wet methods that apply water at the point where silica dust is made.
- Local exhaust ventilation that removes silica dust at or near the point where it is made; and
- Enclosures that isolate the work process or the worker

Additionally, work practice controls may often be used with engineering controls to protect employees. Employees must know the appropriate work practices for maximizing the effectiveness of controls and minimizing exposures. Examples of work practice controls include:

- Inspecting and maintaining controls to prevent or fix malfunctions that would result in increased exposures.
- Ensuring that tools with wet controls spray water at the point of dust generation.
- Positioning local exhaust hoods directly over the exposure source and not opening windows near the local exhaust source.
- Wetting down silica dust before sweeping it up; and
- Scheduling work so that tasks that involve high exposures are performed when no other employees are in the area.

OES must be contacted (oeshelp@clemson.edu) for any General Industry task.

Housekeeping

Dry sweeping or dry brushing, where such activity could contribute to employee exposure to respirable crystalline silica, is specifically prohibited by OSHA. Employees and students will instead use wet sweeping or HEPA- filtered vacuuming instead.

Compressed air is not to be used to clean clothing or surfaces where such activity could contribute to employee exposure to respirable crystalline silica.

If you are exposed to respirable crystalline silica and engaged in a task using equipment and machines not identified in the list above, contact OES for an exposure assessment to determine the engineering controls, work practices, and respiratory protection requirements to perform job activities safely.

Responsibilities

Occupational and Environmental Safety (OES)

- Provide information on silica management for General Industry.
- Conduct or arrange for Silica Awareness training for General Industry.
- Provide expertise and guidance to departments to maintain compliance with 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.
- Develop and maintain the Silica in General Industry Exposure Control Plan and review annually.
- Conduct screenings for employee exposure determinations.
- Coordinate with affected departments to conduct employee exposure assessments.
- Develop and maintains the Respirator Program, as well as conducts respirator training and fit testing
- Maintain records as required.

Supervisors for Affected Departments

- Schedule Silica Awareness training for employees, as necessary.
- Notify OES in cases of uncontrolled releases of visible dust in occupied buildings.
- Provide engineering and work practice controls as needed.
- Request employee exposure assessments with OES.
- 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, consistent with CU Respirator Program
- Schedule employees for respirator training and fit testing annually.

Affected Employees

- Comply with Federal and State regulations and University policies as advised by OES.
- Attend Silica Awareness training.
- Attend Respiratory Protection Training and Fit Testing, as necessary.
- Utilize the proper engineering controls and work practices for the task.
- Review the CU Exposure Control Plan for General Industry.
- Wear respirators and other PPE when necessary
- Conduct work activities in a manner that prevents uncontrolled disturbance of silica-containing materials and the generation of visible dust.

Training

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

- (A) The health hazards associated with exposure to respirable crystalline silica.
- (B) Specific tasks in the workplace that could result in exposure to respirable crystalline silica.
- (C) 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.
- (D) The contents of this section; and
- (E) The purpose and a description of the medical surveillance program.

Silica Awareness Training that meets OSHA's requirements in the General Industry standard will be provided by or arranged by OES for all affected employees that may work with or around silica. This training will consist of either classroom, online, or a combination of training types.

OSHA's fact sheets and CU fact sheets on the Silica Exposure Control Plan for OSHA's Respirable Silica Exposure in General Industry standard will be available for specific job tasks.

Re-training will occur when there is sufficient cause to think a more frequent training is needed or if the CU Exposure Control Plan requirements change.

CU will determine what training is necessary to provide the knowledge and ability for the affected person(s) to implement the written exposure control plan and have available the General Industry Respirable Silica General Awareness Training.

Respirators

Any employee needing a respirator is required by OSHA to be enrolled in a Respiratory Protection Program. The CU Silica Exposure plan tries to eliminate employee exposure to silica through engineering and administrative controls first but, when these steps prove insufficient, respiratory protection will be provided to protect employees and students. If an activity has exposures that cannot feasibly be brought below the PEL by engineering or administrative controls, the employees will participate in the CU Respiratory Protection Program.

Supervisors/employees who suspect they need a respirator should contact OES at (OEShelp@clemson.edu) for assistance.

Medical Surveillance

Employees who are exposed above the Action Level ($25 \mu\text{g}/\text{m}^3$) for 30 or more days per year, or if they develop symptoms of silica exposure, or will need to be enrolled in the University's Respiratory

Protection Program will be enrolled in Clemson's Medical Surveillance Program.

Recordkeeping

Clemson 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 ($25 \mu\text{g}/\text{m}^3$).

- Training records will be kept by the appropriate departmental personnel (UFac, HFac, AFac, CCIT, etc.).
- SDS documents will be kept by the appropriate departmental personnel (UFac, HFac, AFac, CCIT, etc.).
- Sampling records will be maintained by OES.
- Inspection results will be maintained by OES.
- Records of complaints will be maintained by OES.
- Medical surveillance records will be kept by the Occupational Health Nurse.

OES Contacts:

For additional information regarding Crystalline Silica or assistance with the selection of PPE, please contact:

Anne Kogut Industrial Hygiene Manager – akogut@clemson.edu (864)656-2507