

Clemson University Managing Silica Exposure

Version 1.0

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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 see <http://www.whistleblowers.gov>.

It is the policy of Clemson University to maintain a safe and healthy work environment. Department Heads, Managers, and supervisors are responsible for the application and enforcement of University 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 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. 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 number one goal is to *not generate any silica containing dusts above the Permissible Exposure Limit*. 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 Clemson 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 hazardous levels of silica dust.

Program application

This program applies to all Faculty, Staff, Student, Contractors, or Sub-contractors whose activities could generate silica containing dusts and are working in or on Clemson owned or operated properties.

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.

This document is Clemson University's plan.

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

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

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 passers-by.

Outdoors engineering controls (wet cutting or HEPA vacuum) and barricades/tape sufficiently distant from the work should be enough to protect passers-by.

Indoors, additional measures may be necessary to protect building occupants. First, building occupants must be notified of projects. Scheduling project outside of normal working hours when 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 have to be in appropriate PPE, and the abrasive blasting will be conducted either in an enclosure (similar to the enclosures built for asbestos abatement) to contain the dust to the blasting area, or with sufficient separation between the work and the public that passers-by are not exposed.



Sampling and Assessment

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

If airborne silica could be generated during the project, dust control methods must be used to bring the exposure level below the Permissible Exposure Level ($50 \mu\text{g}/\text{m}^3$). ES 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 an approved NIOSH or OSHA methods. Supervisors or employees should contact ES (EHS@clemsun.edu) to request exposure monitoring.

ES 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 methods.

Enforcement

Failure to comply with the OSHA **Silica in Construction** standard, especially such work that exposes passers-by (Faculty, Staff, Students, Visitors), will result in the work being stopped by Environmental Safety until controls can be implemented; this includes contractor/sub-contractor activities.

Procedure

- 1) ES becomes aware of an issue;
- 2) ES evaluates the situation;
 - a. If no exposures (i.e., no visible dust), then ES takes no action;
 - b. If there are exposures (i.e., visible dust) and the work is being performed by CU employees:
 - i. ES 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, ES contacts the CU Project Manager and advises him/her of the situation;
 - ii. If passers-by are being exposed, ES 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.

Continued or repeat violations may result in a contractor or sub-contractor being removed from the job site.

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 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 ES (EHS@clemsun.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

Ring 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 dust collection system

Respiratory Protection: None Required

Dow Drilling Rigs for Concrete

Engineering Control: Commercial shroud or cowling with dust collection system

Respiratory Protection (less than 4 hours per shift):

Enclosed Area: Can Not Use Drill in Enclosed Areas

Outside Area: N100 respirator (disposable or non-disposable)

Respiratory Protection (more than 4 hours per shift):

Enclosed Area: Can Not Use Drill in Enclosed Areas

Outside Area: N100 respirator (disposable or non-disposable)

Vehicle-Mounted Drilling Rigs

Engineering Control: 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. – OR – Operate from within an enclosed cab and use water for dust suppression on 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 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 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 minimize 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 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 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

Dry sweeping or dry brushing where such activity could contribute to employee exposure to respirable crystalline silica is specifically prohibited by OSHA. Use Wet Sweeping or HEPA-Filtered Vacuuming instead.

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.

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

Responsibilities

Environmental Safety (ES)

- Provide information on silica management;
- Conduct Silica Awareness training;
- 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;
- Audits projects as necessary;
- Communicate with regulatory agencies, as needed, as well as with the University community at large;
- Develop and maintain the Silica in Construction Exposure Control Plan;
- Conduct screenings for employee exposure determinations;
- Coordinate with affected departments to secure consultants to provide employee exposure assessments;
- Develop and maintains the Respirator Program, as well as conducts respirator training and fit testing; and
- Maintain records as required.

Affected departments

- Identify a competent person(s) for respirable crystalline silica;
- Schedule Silica training for employees as necessary;
- Notify ES 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;
- Request employee exposure assessments when necessary, scheduled with of ES;
- 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.

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 ES 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 ES;
- 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.

Departments using outside trade contractors

- Ensure Contractor is aware of OSHA's Silica in Construction standard;
- Ensure Contractor has their own Silica Exposure Control Plan;
- Direct Contractor to use the proper equipment;
- If suitable air quality cannot be achieved, schedule work outside of normal working hours.

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.

Training will be arranged by ES.

Re-training will occur a minimum of annually, or when there's sufficient cause to think a more frequent training is needed.

Respirators

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 ($50 \mu\text{g}/\text{m}^3$) by any dust suppression controls then and only then will the employees be brought in to the University's Respiratory Protection Program.

Supervisors/employees who suspect they need a respirator should contact ES (EHS@clemsun.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 if they are 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 will be kept by the appropriate departmental personnel (UFac, HFac, AFac, CCIT, etc.).
- Sampling records will be maintained by ES.
- Inspection results will be maintained by ES.
- Records of complaints will be maintained by ES.
- Medical surveillance records will be kept by the Occupational Health Nurse.