

SILICA EXPOSURES

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WHAT IS SILICA?

Crystalline silica is a common mineral found in the earth's crust. Materials like sand, stone, concrete, and mortar contain crystalline silica. It is also used to make products such as glass, pottery, ceramics, bricks, and artificial stone.

Respirable crystalline silica – very small particles at least 100 times smaller than ordinary sand you might find on beaches and playgrounds – is created when cutting, sawing, grinding, drilling, and crushing stone, rock, concrete, brick, block, and mortar. Activities such as abrasive blasting with sand; sawing brick or concrete; sanding or drilling into concrete walls; grinding mortar; manufacturing brick, concrete blocks, stone countertops, or ceramic products; and cutting or crushing stone result in worker exposures to respirable crystalline silica dust.

Industrial sand used in certain operations, such as foundry work and hydraulic fracturing (fracking), is also a source of respirable crystalline silica exposure.

IS SILICA HARMFUL TO HUMANS?

About 2.3 million people in the U.S. are exposed to silica at work. Workers who inhale these very small crystalline silica particles are at increased risk of developing serious silica-related diseases, including:

- Silicosis, an incurable lung disease that can lead to disability and death;
- Lung cancer;
- Chronic obstructive pulmonary disease (COPD); and
- Kidney disease.

To protect workers exposed to respirable crystalline silica, OSHA has issued two respirable crystalline silica standards: one for construction, and the other for general industry and maritime.

The General Industry standard is 29 CFR 1910.1053 and Construction 29 CFR 1926.1153



WORKPLACE SILICA CONTROL PROGRAM AND EXPOSURE PREVENTION

As of June 23, 2018, the new OSHA General Industry Respirable Crystalline Silica Rule became fully enforceable. The new standard established an 8-hour time-weighted average permissible exposure limit (PEL) of 50 micrograms per cubic meter of air, an action level (AL) of 25 micrograms per cubic meter of air and associated ancillary requirements. Although a postponement of the deadline had been discussed, no delay was granted by the federal regulators. **Enforcement began on time.**

During the first 30 days following the implementation of the new rule, OSHA assisted employers that demonstrated a good faith effort in meeting the new standard's requirements.

If an employer was not making any effort to comply then citations for non-compliance were considered. Therefore, it is best to not take any chances and make sure that appropriate measures are being acted upon to move toward compliance. Such measures might include the following:

- Real-time mapping and a comprehensive audit of the facility
- Implementing necessary engineering controls
- Improving housekeeping
- Employee exposure sampling
- Sampling plan
- Silica exposure control plan

CANADIAN RESOURCES

<http://search.ccinforweb.ccohs.ca/ccohs/jsp/search/ccohs.jsp?QueryText=silica&MaxDocs=500&ResultStart=1&SortSp ec=Score+desc&hTab=0&wb-srch-sub=>

US RESOURCES

www.osha.gov/Publications/OSHA3682.pdf

www.osha.gov/dsg/topics/silicacrystalline/

PROGRAMS

The following is an example Silica Control Program with permission to reprint from North Carolina State University.

DEFINITIONS

PPE, Personal Protective Equipment, PPE includes respirators, work gloves, hard hats, etc... SECM may require that respiratory protection be used for certain work tasks. PPE must be determined using the PPE Hazard Assessment form.

RCS, Respirable Crystalline Silica: Silica dust that is composed of crystalline silica (quartz, Cristobalite, and/or Tridymite) small enough (< 10 microns) to be inhaled into the respiratory system.

SECM, Specified Exposure Control Methods: SECM outline work practices and personal protective equipment requirements for various tasks as outlined by OSHA.

Competent Person, means an individual who is capable of identifying existing and foreseeable respirable crystalline silica hazards in the workplace and who has the authorization to take prompt corrective measures to eliminate or minimize them. The competent person must have the knowledge and ability necessary to fulfill the responsibilities set forth in this Exposure Control Plan.

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) means 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.

Objective Data means information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to Respirable Crystalline Silica associated with a particular product or material or a specific process, task, or activity. The 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.

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. These are fixed locations where RCS materials are being disturbed and control are not adequate to keep RCS below the PEL.

Temporary Restricted Area mean an area demarcated by the employer where an employee is required by the

SECM or standard operating procedure to wear respiratory protection during the disturbance of RCS materials. These are typically project areas or sites where maintenance work is being conducted.

PURPOSE

The purpose of this document is to establish and implement a written exposure control plan that identifies tasks involving silica exposure and methods used to protect employees.

Companies are required to implement the components of the plan needed to ensure compliance with the Occupational Safety and Health Administration (OSHA) standards applicable to respirable crystalline silica, including 29 CFR 1910.1053 (General Industry Standard) and 29 CFR 1926.1153 (Construction Industry Standard).

SCOPE

The Silica Exposure Control Plan applies to all employees who are exposed to respirable crystalline silica (**RCS**) at or above permissible limits.

RESPONSIBILITIES

SUPERVISORS, DEPARTMENT HEADS

- Ensure supervisor(s) understand their responsibilities for implementing the Silica Exposure Control Plan within each work department or operating unit as applicable.
- Actively support this Plan within individual units.
- Ensure all employees are required to follow this Plan in compliance with the company safety and health policy.

DEPARTMENTS

Departments and operating units performing **construction, manufacturing, renovation, maintenance or repair work** covered by this shall:

- Designate a **competent person(s)** to implement the written exposure control plan and to provide oversight on departmental operations to determine when work activities may generate RCS that requires review by EHS.
- Ensure the work practices and procedures used to control exposure to RCS comply with this program.
- Ensure all reasonable precautions are taken to prevent exposure of bystanders and the general public when work involving RCS is performed.
- Ensure covered employees attend required training, and participate in the medical surveillance program as required.

All other departments performing work where RCS may be created or released shall coordinate with EHS to have the work activity reviewed and air monitoring performed as necessary. RCS can be created by crushing, drilling, grinding, cutting, sanding or abrading certain types of materials such as sand, stone, mortar and concrete,

porcelain and ceramic materials, brick and pottery products, plaster, sheetrock, compounds, and refractory materials. RCS may also be found in the clay body and glazes of pottery, released during jewelry production, used in foundries, and may be released when mining, excavating or otherwise disturbing the earth surface. Where exposures of concern are identified by EHS, EHS will work with the department to develop and implement a standard operating procedure (SOP) that describes departmental implementation of this Plan.

DESIGNATED DEPARTMENTAL SUPERVISOR OR COMPETENT PERSON

Notify EHS when work activities are planned that may generate RCS where monitoring may be required.

- Employee exposure monitoring is not required if a task is listed in the Specified Exposure Control Methods (**SECM**) section of this program and the engineering controls, work practices and PPE are used as listed.
- Where the work involving RCS will be performed near the general public and appropriate dust controls cannot be used, area air monitoring may be required. The designated supervisor or competent person is to provide advanced notice to EHS if such monitoring will be needed.
- Work with supervisors to review all power tool usage to assure compliance with the dust controls established in the SECM. Where respirators are required, supervisors shall only allow employees who have been approved by EHS within the past twelve months to use respirators to perform those tasks.
- Assure **temporary restricted areas** are established, dust controls are used to prevent migration of dust from the worksite, and building air supply and returns in the work area are covered when work will be performed near areas occupied by the general public and where respiratory protection is required.

SUPERVISORS

- Implement and ensure procedures are followed in accordance with this Plan.
- Ensure that staff are aware of this Plan, instructed on the details of implementation, and provided with the equipment and methods of control (e.g. engineering controls, work practice controls and respirators) outlined in the SECM.
- Make sure employees have completed Silica Hazard Awareness training.
- Ensure only employees who have been approved by EHS are allowed to use respirators.
- Notify EHS when a task must be performed that is not covered in the SECM.
- Contact EHS to request technical assistance, and to evaluate health and safety concerns within their department.

EMPLOYEES

- Comply with this Plan and any additional safety recommendations provided by supervisors and/or EHS regarding the Silica Exposure Control Plan.
- Complete Silica Hazard Awareness training.
- Contact the supervisor or EHS to request technical assistance, and to evaluate health and safety concerns within their department.

CONTRACTORS

Contractors shall comply with the Company Contractor Safety Guidelines and the following:

- Contractors shall take all necessary steps to comply with the exposure limits for silica established in 29 CFR 1926.1153. The contractor's written Exposure Control Plan must detail how potential exposure to NCSU personnel and the general public in adjacent areas will be kept below allowable limits. A copy of this plan shall be provided to EHS and/or the university Project Manager upon request.
- Where tasks are performed indoors or in an enclosed area, exhaust ventilation shall be provided as needed to minimize the accumulation of visible airborne dust. If the dust is exhausted inside the building or in an area outside where building occupants or the general public may be exposed, the system must incorporate HEPA-filtration.
- If the building ventilation system provides air to an area where "restricted work" is being performed, the building air returns shall be blanked or closed while such work is in progress. Contractors must coordinate this with the university Project Manager.
- A "temporary restricted area" must be established where tasks performed in accordance with Table 1 of 29 CFR 1926.1153 require that respiratory protection be used, or where tasks are performed that are not listed in Table 1, and where no historic or objective data exists to prove exposures will be below the action level. Temporary Restricted Areas must be designated with signs, barriers, or other effective means that will ensure unauthorized persons do not enter. If such work is performed in occupied buildings, dust barriers shall be installed as necessary to isolate the restricted area. See Odor and Dust Controls

ENVIRONMENTAL HEALTH AND SAFETY

- Establish and maintain the company Silica Exposure Control Plan.
- Provide training and guidance to supervisors and competent persons on SECP.
- Perform air monitoring for employees to evaluate silica exposures, and provide technical assistance with establishing new control measures and developing worksite or task-specific Exposure Control Plans.
- Perform audits of work performed to assure compliance with required silica control measures, and

to ensure Departmental Exposure Control Plans are developed and updated as required.

PLAN REQUIREMENTS

Initial Exposure Assessment

Exposure monitoring will be conducted when any employee is or may reasonably be expected to be exposed to respirable crystalline silica at or above the action level. Exposure monitoring may also be performed if work covered by this Plan is being performed near areas occupied by the general public where respiratory protection is required by the SECM, or where other appropriate dust controls cannot be employed.

Employee exposure monitoring is not required if the task is listed in the SECM section of this Plan and the engineering controls, work practices, and PPE are used as listed. Exposure monitoring is also not required if EHS has either objective or historic data that shows employees will not be exposed above limits for the task being performed. If a department purchases tools not listed in the SECM that incorporate dust controls, notify EHS in order to obtain their objective data on the effectiveness of the dust controls.

If a task needs to be performed that is not outlined in the SECM section of this program, please contact EHS for assistance.

Periodic Exposure Assessment

If the most recent results are at or above the action level but are below the permissible exposure limit (PEL), exposure monitoring will be repeated every 6 months.

If the most recent results are at or above the PEL, exposure monitoring will be repeated within 3 months.

Periodic exposure monitoring may be discontinued if results from two consecutive sampling periods taken at least 7 days apart show that employee exposure is below the action level.

Monitoring will be conducted whenever a change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the action level.

Employee Notification

Employee(s) will be notified in writing of the results of the assessment, or the results will be posted in an appropriate location accessible to all affected employees, within 5 workdays. If the result is above the PEL, the notification will include the means that are being taken to reduce the exposure to below the PEL.

Regulated and Restricted Areas

A **regulated area** will be established where work exposures at a fixed location are known to be at or above the PEL on a consistent basis.

A **regulated area** must be separated from other areas in a way that will minimize the number of employees exposed. The following sign will be posted at each entrance to the regulated area:

DANGER, RESPIRABLE CRYSTALLINE SILICA, MAY CAUSE CANCER,

CAUSES DAMAGE TO LUNGS, WEAR RESPIRATORY PROTECTION IN THIS AREA

AUTHORIZED PERSONNEL ONLY

Only employees who have work to perform are allowed to enter a regulated area. All employees entering the regulated area must wear a respirator, regardless of the amount of time spent in the area. Air from a regulated area shall not be recirculated by the building ventilation system unless it is first cleaned by HEPA filtration.

A **temporary restricted area** will be established where the task is covered in the Specified Exposure Control Methods section of this plan and the task will not be performed regularly in the same area or location.

Tasks performed in accordance with the SECM and where respirators are required for the task shall be performed in a **temporary restricted area**. A temporary restricted area shall be designated by signs, barriers, or other effective means that will ensure unauthorized persons do not enter. Where these tasks are performed near areas occupied by the general public, dust barriers shall be installed as needed to prevent dust migrating into those areas. If a building ventilation system provides air to the area where restricted work is being performed, the building air returns from that system shall be blanked or closed while that work is in progress.

Where tasks are performed indoors or in an enclosed area, exhaust ventilation shall be provided as needed to minimize the accumulation of visible airborne dust. If this dust is exhausted inside the building, or outside in an area where the public may be exposed, the exhaust system must incorporate HEPA filtration. For tasks performed using wet methods, water shall be applied at a rate that is sufficient to minimize the release of visible dust.

Written Exposure Control Plan

When departmental tasks with potential exposure to RCS are limited to those identified in this Plan (see: Specified Exposure Control Method and Appendix I) and are performed in accordance with this Plan and the SECM are followed, this Plan will serve as the Written Exposure Control Plan. When departmental tasks with potential exposure to RCS are performed that are not identified within this Plan, the department must develop a Departmental specific exposure control plan (or standard operating procedure) that describes departmental implementation of this Plan, which includes identifying SECM.

For fixed worksites where exposures above the action level occur on a routine basis, a worksite-specific written exposure control plan must be developed. Please contact EHS for assistance with writing your plan. The plan must be reviewed at least annually.

Engineering and Work Practice Controls

For any work task or work location where the exposure to RCS is above permissible limits, engineering controls (i.e. wet work, ventilation) or work practice controls (i.e.

housekeeping, inspections, scheduling) will be implemented to lower the exposure as much as possible. When engineering and work practice controls cannot lower the exposure to below permissible limits (or when specified by the SECM), respirators shall be used in accordance with this Plan and NCSU's Respiratory Protection Program.

Housekeeping

Dry sweeping or dry brushing of dust containing RCS is prohibited. Instead, use a HEPA filtered vacuum cleaner, followed by wet mopping or wet sweeping as necessary.

Do not use compressed air to clean an employee's clothes that have become soiled with dust containing respirable crystalline silica. Rather, use a HEPA filtered vacuum to remove dust followed by laundering. Coveralls, launderable or disposable, can be used to minimize the transfer of dust to other areas such as an office, break room, vehicle or home environment. Vacuum the coveralls with a HEPA filtered vacuum before removing and launder or dispose of them as appropriate. Disposable apparel and vacuum filters can be disposed in normal trash.

Specified Exposure Control Methods (SECM)

For each employee working with materials containing crystalline silica and engaged in a task using the equipment and machines listed in **Appendix I (SECM)**, the supervisor and/or competent person shall ensure the engineering controls, work practices, and respiratory protection are used as specified. In all cases, be sure to operate and maintain the tool in accordance with the manufacturer's instructions to minimize dust emissions. If the designated engineering controls are not available or feasible, or if the equipment is not listed in the SECM the department must establish SECM to include in their plan or standard operating procedures. Contact EHS for assistance and guidance on such plans or SOP. (Note: As data and/or exposures assessment are completed additional tasks or equipment will be included in the SECM.)

Medical Surveillance

Any employee required to use a respirator for exposure to RCS for 30 or more days (any part of a day) per year will be provided a medical evaluation and other required medical services at no cost to the employee. The medical evaluation is performed initially and at least every 3 years, unless the Occupational Physician requires a more frequent review.

The medical evaluation will include medical and work history, a physical exam, chest x-ray, pulmonary function test, tuberculosis test, and any other test recommended by the Occupational Physician. For details see Appendix II Medical Surveillance Guidelines of this plan.

If a respirator is required to be worn by an employee, the employee must be medically cleared, trained and fit tested for a respirator, initial and annually. See Respiratory Protection Program.

Hazard Communication

Silica must be included in each department's hazard communication program as applicable. This includes proper labeling and having a Safety Data Sheet (SDS).

Training

Any employee who is exposed to silica above the action level is required to complete NCSU's Silica Hazard Awareness training (EHPS-OH500) and site and task specific training provided by their supervisor. Verification of site specific training must be documented (See Appendix III). EHS will provide instructor lead training to supervisors and competent persons on implementation of NCSU Silica Exposure Control Plan.

Recordkeeping

NCSU will make and maintain an accurate record for exposure measurements, objective data, and medical surveillance required under OSHA's RCS standards. See Appendix IV for details on recordkeeping requirements.

REVIEW AND AUDITS

Departmental Reviews

Each Department shall review its written exposure control plan on an annual basis. The review shall consist of determining if the tasks and controls are still being used as described and if the plan is effective in reducing silica exposure.

EHS Audits

EHS will audit each department's exposure control plan on a yearly basis. The audit will cover all aspects of the written program to assure they are up to date and complete. The audit will also include a walkthrough of the area to check equipment, control measures, training records, and other aspects of the plan.

Appendix I. Specified Exposure Control Methods (SECM, Table 1)

https://drive.google.com/open?id=1rmx1qOZn0HwjgkFJkeH-QRF_rIT92G0f

Appendix II: Medical Surveillance Guidelines

https://drive.google.com/open?id=1cqoQia_vh4Tm2TkeQMfW3kABT08BK84x

Appendix III. Silica Hazards Communications Training Verification Form

<https://drive.google.com/open?id=1qGikuJqn6fFuDGmHBiRiekH0ft5WFDVs>

Appendix IV. Record Keeping Requirements

https://drive.google.com/open?id=1_A0Sy1Zmmumfb-aLLQUJZlyeaPtOIZ1F

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