UCONN
UNIVERSITY OF CONNECTICUT

Policies, Programs and Procedures

Division of Public Safety

Respirable Crystalline Silica Exposure Control Plan

Last Reviewed Date: 7/2020
Last Revised Date: 7/2020
Effective Date: 7/2020
Applies To: Faculty, Staff, Students, Others
For More Information Contact: EHS, at
860-486-3613 ehs@uconn.edu

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I. Purpose

This exposure control plan has been developed to protect the health and safety of the University of Connecticut's employees, building occupants and visitors from potential exposure to crystalline silica and is in accordance with the Occupational Safety and Health Administration's (OSHA's) Silica in General Industry Standard, 29 CFR 1910.1053.

II. Scope

This plan applies to all faculty, staff, and student employees at the Storrs, regional and Law School campuses involved in work activities that can cause occupational exposures to respirable crystalline silica above the OSHA Action Level. It does not apply to silica exposures in construction or renovation work. These activities are governed by the Silica in Construction Exposure Control Plan. It also does not apply to exposures that result from the processing of sorptive clays.

III. Policy Statement

As stated in the University's Health and Safety Policy, the University of Connecticut is committed to providing a healthful and safe environment for all activities under its jurisdiction and complying with federal and state health and safety standards. As such, to minimize exposures to silica dust and to comply with OSHA's Silica in General Industry standard, this Crystalline Silica Exposure Control Plan shall be implemented at the University of Connecticut.

IV. Enforcement

Violations of this plan may result in appropriate disciplinary measures in accordance with University Laws and By-laws, General Rules of Conduct for All University Employees, applicable collective bargaining agreements, and the University of Connecticut Student Code.

V. Definitions

Action Level – a concentration of airborne respirable crystalline silica of 25 µg/m^3, calculated as an 8-hour time-weighted average. Exceeding this level requires compliance with the OSHA Standard and the University's Silica Exposure Control Plan.

Crystalline Silica – Silicon dioxide (SiO_2). Crystalline refers to the orientation of the SiO_2 molecules in a fixed pattern as opposed to a random molecular arrangement defined as amorphous. The three common crystalline forms of silica encountered are quartz, tridymite, and cristobalite. Amorphous silica is not included in this definition and is not part of the OSHA standard nor this Exposure Control Plan.

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

Filtering Face-piece (dust mask) – a negative pressure particulate respirator with a filter as an integral part of the face-piece or with the entire face-piece composed of a filtering medium.

High Efficiency Particulate Air (HEPA) filter – a filter that is at least 99.97% efficient in removing mono-dispersed particles of 0.3 micrometers in diameter.

Permissible Exposure Limit (PEL) - a concentration of airborne respirable crystalline silica of 50 µg/m^3, calculated as an 8-hour time-weighted average. Exceeding this level requires respiratory protection, in addition to complying with all other aspects of the OSHA standard and the University's Silica Exposure Control Plan.

Physician or other Licensed Healthcare Profession (PLHCP) – an individual whose legally permitted scope of practice (i.e., license, registration or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the particular health care services required.

Regulated Area – Areas where it is documented or reasonably anticipated to have exposures that exceed the permissible exposure limit. Respiratory protection is required in regulated areas.

Respirable crystalline silica – the portion of airborne crystalline silica (quartz, tridymite, and/or cristobalite) that is capable of entering the gas-exchange regions of the lungs if inhaled. This typically includes particles sizes of 10 µm or less.

VI. Introduction

Crystalline silica (silicon dioxide, SiO_2) is a common mineral found in many naturally occurring and man-made materials used in building and hardscape construction. It is an

important industrial material found abundantly in the earth's crust. There are three forms of silica: quartz, cristobalite, and tridymite. Quartz, the most common form, is a component of soil, sand, stone, rock, concrete, brick, block, mortar, and plaster. It is also added to various materials such as paints, ceramics, stucco, grout and cementitious mixes.

Respirable crystalline silica is composed of particles that are typically 100 times smaller than ordinary sand found at beaches or playgrounds. At this size the particles can enter the respiratory system and cause disease. Respirable-sized particles are generated during high-energy operations like cutting, blasting, grinding, drilling, mixing, and crushing silica-containing materials or when abrasive blasting involves silica-containing materials.

There are recognized health effects from exposure to respirable crystalline silica. It is not just an inert dust. Most common is silicosis, a permanent and debilitating respiratory disease. The disease involves scarring in the lungs, making them less flexible and less able to utilize oxygen. There are 3 forms of silicosis: Acute (marked by high intense exposures over a short period of time); Accelerated (which can develop after exposure from 5-10 years); and 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 also make individuals more susceptible to tuberculosis. Other non-respiratory diseases associated with silica exposure include kidney disease and autoimmune disorders such as scleroderma, lupus, and rheumatoid arthritis.

In order to further protect worker health, OSHA developed a standard for crystalline silica exposure in general industry which incorporates required education and training, engineering and work practice controls, exposure monitoring, respiratory protection and medical surveillance.

VII. Responsibilities

A. Environmental Health and Safety (EHS)

a. Provides information to the University administration to support decisions on silica management;
b. Conducts Silica Awareness training;
c. Provides expertise and guidance to departments to maintain compliance with regulatory requirements and university policy;
d. Recommends appropriate response actions to control or eliminate potential hazards;

e. Communicates with regulatory agencies, as needed, as well as with the University community at large;
f. Develops and maintains the Silica in General Industry Exposure Control Plan;
g. Conducts screenings for employee exposure determinations;
h. Coordinates with affected departments to secure consultants to provide employee exposure assessments;
i. Develops and maintains the Respirator Program, as well as conducts respirator training and fit testing; and
j. Maintains records as required under section XVI of this plan.

B. Affected Departments with Employees Exposed to Respirable Silica

a. Complete Appendix A: Department-specific Silica Exposure Control Plan;
b. Maintain the Exposure Control Plan and completed Appendix A in work environment
c. Schedule Silica Awareness training for employees as necessary;
d. Provide engineering and work practice controls as needed;
e. Arrange for employee exposure assessments when necessary with the assistance of EHS;
f. Schedule medical surveillance for affected employees, initially and then every 3 years unless sooner as identified by the PLHCP;
g. Arrange for medical evaluation for respirator use, in accordance with the University's Respirator Program; and
h. Schedule employees for respirator training and fit testing annually, as necessary.
i. Identify existing and foreseeable respirable crystalline silica hazards and take prompt action as identified in this section; and
j. Notify EHS when problems arise, there is a change in engineering controls and work practices, or in situations of uncontrolled releases of visible dust in occupied buildings.

C. Personnel

a. Comply with Federal and State regulations and UConn policies as advised by EHS;
b. Attend Silica Awareness training;
c. Attend Respiratory Protection Training and Fit Testing as necessary;
d. Utilize the proper engineering controls and work practices;

e. Utilize appropriate housekeeping measures;
f. Wear respirators when necessary; and
g. Conduct work activities in a manner that prevents uncontrolled disturbance of silica-containing materials and the generation of visible dust.
h. Notify supervisor when problems arise, there is a change in engineering controls and work practices, or in situations of uncontrolled releases of visible dust in occupied buildings.

VIII. Regulatory Requirements

The OSHA Silica in General Industry Standard and this plan apply to all exposures that exceed the Action Level of 25 µg/m^3. The standard does not apply to tasks where employee exposures will remain below the Action Level under any foreseeable conditions. If the exposure is below the Action Level due to engineering controls, however, the standard still applies. Employees potentially exposed to respirable crystalline silica must undergo employee exposure monitoring to determine if their exposures exceed the Action Level, without considering the use of respiratory protection. If so, routine employee exposure assessments must be instituted as well as medical surveillance if the exposure occurs 30 or more days a year. If exposures are found to exceed the Permissible Exposure Limit of 50 µg/m^3, then engineering and work practice controls, along with respiratory protection will also be required for those activities.

All departments, laboratories, studios, and other locations affected by the OSHA Silica in General Industry Standard and the University Respirable Silica Exposure Control Plan must complete a Department- Specific Silica Exposure Control Plan (found in Appendix A) to identify specific tasks, various control strategies, and housekeeping measures utilized to reduce exposures. The Department- Specific Silica Exposure Control Plan must be accessible to personnel in the work environment.

The following table illustrates the regulatory requirements necessary based upon the employee exposure assessment results:

Crystalline Silica in General Industry Requirements			
Regulatory Requirements	**Employee Exposure Measurements**		
	Below Action Level	**Above Action Level**	**At or Above PEL**
Training	No*	Yes	Yes

Written Exposure Control Plan (Appendix A)	No*	Yes	Yes
Additional Employee Exposure Monitoring	No**	Every 6 months	Every 3 months
Engineering and Work Practice Controls	No	No***	Yes
Housekeeping	No	Yes	Yes
Respiratory Protection	No	No	Yes
Regulated Areas and Signage	No	No	Yes
Medical Surveillance	No	When exposed >30 days/year	When exposed >30 days/year

* Not required unless engineering controls are in use that reduces exposures
** unless there is a change in workplace conditions (materials, controls, environmental conditions)
*** though recommended

IX. Employee exposure assessment

Employees expected to be exposed to respirable crystalline silica in the workplace must undergo an employee exposure assessment. The purpose of the assessment is to identify where exposures are occurring, help to determine proper and effective control methods, and to prevent exposures above the Permissible Exposure Limit.

There are two options when it comes to conducting employee exposure assessments: the performance option and the scheduled monitoring option. For each option, the employer must ensure the assessment reflects the exposures of each employee, on each shift, at each job classification, and in each work area.

With the performance option, the employer can use air monitoring data and/or objective data to determine exposures. Objective data would include historical monitoring data, data from industry-wide surveys, and direct-reading meters along with concentrations of silica in the impacted medium to calculate exposures. In order to use historical or industry-wide data, the workplace conditions must match the activities previously monitored. They have to be similar processes, types of materials, control strategies, and environmental conditions. The performance option must occur before work begins and must be reassessed whenever there is a change in work conditions.

The scheduled monitoring option identifies when and how often monitoring must be done when not relying on historical and industry-wide data. In this option, initial air monitoring is conducted to assess exposure on the basis of personal breathing zone air samples that

reflect the exposures of employees on each shift, for each job classification, in each work area. The results dictate when further testing is necessary:

- If initial results are below the Action Level, no further testing is required.
- If results are above the Action Level but below the PEL, monitoring must be repeated every 6 months.
- If results are above the PEL, monitoring occurs every 3 months.
- Should the workplace conditions change (change in materials, controls, environmental conditions), monitoring will need to be repeated and then follow the same schedule.

EHS can assist with determining employee exposures. If employee exposure assessments are necessary, EHS can help the department select an appropriate industrial hygiene consultant to conduct the monitoring and determine response actions. All affected employees represented by the assessment must be notified of results by written notification within 15 days of receipt. Should exposures be above the PEL, the written notification must include a description of the corrective measures to be taken to reduce exposure.

X. Engineering Controls

Engineering controls must be utilized to keep employee crystalline silica exposures below the PEL. Engineering controls are more effective than respiratory protection and must be used unless such controls are not feasible.

Integrated water delivery systems (WDSs) are the most effective engineering control, and even the use of wet methods for clean-up can greatly reduce exposures. The integrated water delivery systems must supply an adequate supply of water for dust suppression, the nozzle must be working properly to apply the water at the point of generation and must not be clogged, and all hoses and connections must be intact. Flow rates must be supplied by the manufacturer and sufficient to minimize release of visible dust. Fine mists are more effective than a water stream. Additional exhaust should be provided as needed to minimize the accumulation of visible airborne dust when operating indoors or anywhere where airborne dust can build up such as in a confined area. Any wet slurry produced must be prevented from accumulating and drying. Even using wet methods such as wet wiping or wet mopping can be appropriate and effective.

When water delivery systems (WDS) are used, employees will follow safe work practices. Some examples of safe work practices include, but are not limited to: ensuring electrical equipment is specifically designed for the work environment; following manufacturer specifications regarding water pressure and flow rate; providing water directly to the blade

of saws and other tools whenever possible when cutting or impacting concrete and other silica containing materials; cleaning wet slurries from work surfaces when the work is complete; and manually wetting surfaces using misters or hoses when WDS systems are not available as a standard or retrofitted part of a tool.

Some equipment can be equipped with commercially available dust collection systems or local exhaust ventilation (LEV) systems. In this case, the shroud or cowling must be intact and installed by the manufacturer's instructions, the hose connecting the tool to the vacuum must be intact and not kinked, air flow must be provided as recommended by the manufacturer, the filters must be rated a minimum of 99% efficiency and cleaned and changed in accordance with the manufacturer's instructions, and dust collection bags must be emptied to avoid overfilling.

Larger scale LEV systems incorporate a hood, ducting, an air cleaner, an air mover and a discharge. These are effective at removing silica at the point of operation, preventing entry into the breathing zone. Systems must be maintained and utilized properly, according the manufacturers' instructions. Conducting work in fume hoods in laboratories is also an appropriate engineering control. Fans are not effective dust control devices and must not be used as the primary method for managing dust. They can be used to supplement other control methods.

When LEV systems are used employees must follow safe work practices. Some examples of safe work practices for LEV systems include, but are not limited to: using vacuum attachment systems that capture and control dust at its source whenever possible; maintaining dust control systems in optimal working condition; ensuring proper placement of LEV arms in proximity to the point of operation; operating grinding wheels at the manufacturer's recommended RPM to avoid generating excess airborne dust levels; using HEPA vacuum units (approved for silica dust) in accordance with manufacturer's instructions; and grinding concrete when wet to reduce silica dust release whenever possible. Another engineering control is isolation. Isolation separates employees from the dust source by containing the dust or isolating the employees. Enclosures, ventilating a work space with a negative air machine or snorkel type ventilation systems, and establishing restricted areas are all ways to isolate the work process or worker. An example is a properly ventilated control booth, for use with a saw, or an abrasive blasting booth. When utilizing this type of control it is important to minimize the size of the operator opening to reduce the chance of dust escaping into the operator's breathing area, use a fan large enough to provide an average of 250 feet per minute air velocity across the face of the operator opening, position the booth so that the exhaust fan does not blow dusty air on other employees, plan for a trapdoor in the booth to remove debris, and do not let the saw blade protrude past the open face of the booth

XI. Work Practice Controls

Work practice controls must be designed and used to minimize the release of silica prior to the start of the job or project. Work practice controls must be evaluated and designated as part of the project planning process and included in task specific exposure controls plans. Exposure control strategies include: housekeeping, restricting work areas, hygiene practices, training, and supervision procedures.

Additional work practice controls include, but are not limited to scheduling of work activities to minimize the effect on others, erecting barriers around known crystalline silica dust generating activities and posting signs at all entrances to regulated areas.

XII. Personal Protective Equipment

Along with utilizing engineering controls and following work practice controls, workers may be required to wear personal protective equipment (PPE). PPE can help further reduce the employee's exposure to silica. Personal protective equipment may include protective clothing, safety eyewear, and air purifying respirators which have been designated for use in silica hazard areas. Respiratory protection will be required when engineering and work practice controls are not effective enough to reduce exposure and when these controls are not feasible. Entry into any regulated area requires the use of respiratory protection.

Respirator use at the University must be in accordance with the OSHA Respirator Standard and the University's Respirator Program. When respirators are required, employees must undergo a medical evaluation by a physician or other healthcare professional, and then attend training and fit testing. These are annual requirements. See the EHS website for further information on the program, medical evaluation process, and training and fit testing.

Voluntary use of filtering face-piece respirators, or dust masks, are allowed when exposures to silica do not exceed the PEL. Employees can choose to wear these masks for comfort purposes only. Compliance with the OSHA Respirator Standard and the University's Respirator Program are still required. Training will be necessary for voluntary use of these respirators. See the EHS website for information on training opportunities.

For general industry work that is indistinguishable from work covered by Table 1 in the construction silica standard, 29 CFR 1956.1153, the employer may comply with the construction standard, including the specified exposure control methods in Table 1 for that task as long as the task is not be performed regularly in the same environment and conditions. Table 1 provides engineering and work practice controls, as well as respiratory protection recommendations for 18 common construction activities utilizing dust-producing equipment. These tasks and controls are dictated by OSHA and apply only to the transient

nature of construction work where employees can be expected to do different tasks in different locations daily.

XIII. Housekeeping

In addition to following engineering and work practice controls recommended by OSHA and industry practice during activities that produce respirable crystalline silica exposure, housekeeping must also be addressed since this could contribute to employee exposure. Clean-up activities involving respirable crystalline silica dust must be done utilizing wet methods and/or HEPA vacuums. Dry brushing, dry sweeping, and use of compressed air are prohibited when cleaning up silica dust. Compressed air can only be used when there is a ventilation system that captures the dust cloud.

When wet methods would cause damage or create a hazard in the workplace, it is not required to be used. In this instance, other means of cleaning must be considered, such as use of the HEPA vacuums.

XIV. Regulated Areas

In addition to protecting employees conducting the tasks on silica containing materials, building occupants, staff, students, and the public must be protected from the generation of silica dust. Should exposures be found to exceed, or can reasonably be expected to exceed, the PEL, regulated areas must be established. Respiratory protection is required in regulated areas. Regulated areas must be demarcated with signs to restrict access to building occupants and minimize worker exposure to silica. Employers must post signs at each entrance to the regulated area. **Signage must state:**

DANGER

RESPIRABLE CRYSTALLINE SILICA

MAY CAUSE CANCER

CAUSES DAMAGE TO LUNGS

WEAR RESPIRATORY PROTECTION IN THIS AREA

AUTHORIZED PERSONNEL ONLY

XV. Medical surveillance

Medical surveillance will be required for any employee who exceeds the Action Level for 30 or more days a year.

Medical surveillance is required upon an employee's initial assignment to a job in which such tasks will be performed for 30 days or more a year and must be repeated at least every 3 years, or more frequently if recommended by the PLHCP.

Components of the surveillance include:

- A medical and work history that focuses on past, present and anticipated exposure to respirable crystalline silica and other agents affecting the respiratory system; and any history of respiratory system dysfunction and symptoms of disease;
- A physical exam that focuses on the respiratory system;
- A digital or chest X-ray;
- A lung function (spirometry) test;
- Testing for latent tuberculosis infection; and
- Any other tests deemed appropriate by the PLHCP.

Information Provided to the PLHCP:

- A copy of the Silica in General Industry Standard;
- The employee's former, current, and anticipated levels of occupational exposure to respirable crystalline silica;
- A description of the 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; and
- Information from records of employment-related medical examinations previously provided to the employee and currently within the control of the employer.

Scheduling an Examination

Medical surveillance and examinations required under this exposure control plan are the responsibility of the employing department. Medical examinations for University employees are provided by the University of Connecticut Occupational and Environmental Health Center (OEHC) Clinic at UConn Health in Farmington, or CorpCare Occupational Health in South Windsor, CT. Other providers may be used with the prior approval of EHS. Call the OEHC Clinic at (860)679-4564 or CorpCare at (860)647-4796 to schedule an exam. Tell the

person who answers that you wish to schedule medical surveillance for crystalline silica. You will be asked for the employee's name, department number, the name of the employee's supervisor, and pertinent departmental financial information. Personal health insurance must not be used.

Once the appointment has been scheduled, contact EHS at (860)486-3613 and inform them of the pending appointment.

Employees must receive a written medical report within 30 days of the medical examination performed. Employers do not receive these reports. Instead, the employer must receive a written medical opinion within 30 days of the examination.

The medical opinion to the employer must include:

- Date of the examination
- Statement that the examination has met the requirements of the silica standard
- Any recommended limitations on the employee's use of respirators
- If the employee provides written authorization, the written opinion to the employer shall also contain either or both of the following:
    - Any recommended limitations on the employee's exposure to respirable crystalline silica
    - A statement that the employee should be examined by a specialist if deemed appropriate by the PLHCP

If the employee provides written authorization, the written opinion shall also contain any recommended limitations on the employee's exposure to respirable crystalline silica; and/or, a statement that the employee should be examined by a specialist if it is deemed appropriate by the PLHCP.

XVI. Training

All University employees affected by this standard and exposure control plan must be trained in silica awareness and demonstrate knowledge and understanding in the following topics:

- Health hazards associated with respirable crystalline silica, including cancer, lung effects, immune system effects, and kidney effects;
- 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, including engineering and work practice controls as well as respiratory protection;
- The contents of the OSHA Silica in General Industry Standard;
- The purpose and description of the medical surveillance program; and
- The availability of the OSHA Silica in General Standard, 1910.1053.

Additionally, the employer shall ensure that each employee has access to labels on containers of crystalline silica and safety data sheets, and is trained in accordance with the provisions of the Hazard Communication Standard and the University's Hazard Communication Program.

Training is required upon initial assignment to the job where silica-containing materials will be impacted. EHS will provide training in accordance with this plan. Retraining will be necessary if a new task or equipment is introduced, new controls are introduced, or any time there is a deficiency in the employee's knowledge such as an employee failing to use required engineering or work practice controls.

XVII. Recordkeeping

Records that are required to be collected and maintained under this exposure control plan are noted below. Departments must maintain employee medical records. They must also forward to EHS copies of any consultant reports concerning employee exposure assessments. EHS will maintain employee exposure assessments and objective data records used to assess exposures. .

Employee Exposure Assessments

- Date measurement taken;
- The task monitored;
- Sampling and analytical method used;
- Number, duration and results of samples taken;
- Laboratory that performed analysis;
- Type of personal protective equipment worn by those monitored;
- Name, social security number, and job classification of all employees represented by the monitoring, indicating which employees were actually monitored; and
- Maintained in accordance with 1910.1020, for at least 30 years.

Objective Data relied on for compliance

- The crystalline silica-containing material in question;

- The source of the objective data;
- The testing protocol and results;
- A description of the process, task, activity, material, or exposures on which the objective data were based;
- Other data relevant to the process, task, activity, material or exposures on which the objective data were based; and
- Maintained in accordance with 1910.1020, for at least 30 years.

Medical Surveillance

- Name and social security number
- A copy of the PLHCPs' and specialists' written medical opinions
- A copy of the information provided to the PLHCPs and specialists
- Maintained in accordance with 1910.1020, for duration of employment plus thirty years.

Appendix A

Department-Specific Silica Exposure Control Plan Form	
Department/Unit/Location:	**Date of Preparation:**
Name of Principal Investigator, Coordinator or Supervisor	
Name:	Phone Number:
Descriptions of tasks in the workplace that involve exposure to respirable crystalline silica:	
Description of engineering and work practice controls used to limit exposure, *for each task*:	
Is respiratory protection being used, including dust masks? If so, describe type of respirator and tasks:	
Description of housekeeping measures used to limit employee exposure to respirable crystalline silica:	

Appendix B

Signage for Regulated Areas

Appendix C

1910.1053 Silica in General Industry Standard

https://www.osha.gov/silica/SilicaGeneralIndustryRegText.pdf