



West Virginia University®

ENVIRONMENTAL HEALTH & SAFETY

RESPIRABLE CRYSTALLINE SILICA EXPOSURE CONTROL PLAN

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WEST VIRGINIA UNIVERSITY

Respirable Crystalline Silica Exposure Control Plan

OSHA 29 CFR 1926.1153 and OSHA 29 CFR 1910.1053

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1. INTRODUCTION

The Respirable Crystalline Silica Exposure Control Plan was developed to prevent employee exposure to hazardous levels of respirable crystalline silica. Respirable crystalline silica (silicon dioxide, SiO₂) is a common mineral found in many naturally occurring and man-made materials used in building and hardscape construction. Respirable-sized particles are generated during high-energy operations like sawing, cutting, grinding, drilling, excavating, and crushing silica-containing materials, or when abrasive blasting with silica-containing materials or on substrates that contain silica. Respirable crystalline silica exposure at elevated levels can lead to health effects such as silicosis, lung cancer, and kidney disease.

While Occupational Safety and Health Administration (OSHA) has had permissible exposure limits for a long time, in 2016 they developed a standard for silica exposure in construction, which incorporates required engineering and work practice controls, employee exposure monitoring, respiratory protection and medical surveillance to protect employees exposed to silica dust during normal maintenance, renovation, and demolition activities. The standard does not apply to tasks where employee exposures will remain below the Action Level of 25 µg/m³ under any foreseeable conditions.

The elements of this exposure control plan take into consideration all of the components of the OSHA Silica in Construction Standard, 29 CFR 1926.1153, and the OSHA Respirable Crystalline Silica Standard, 29 CFR 1910.1053.

2. PURPOSE

This exposure control plan has been developed to protect the health and safety of West Virginia University employees, building occupants, and visitors from potential exposure to crystalline silica and is in accordance with the OSHA's Silica in Construction Standard, 29 CFR 1926.1153 and the OSHA's Respirable Crystalline Silica Standard, 29 CFR 1910.1053.

3. SCOPE

This program applies to all faculty, staff, and student employees of WVU who have the potential to be exposed to respirable crystalline silica when covered by the OSHA Standard. Contractors should have their own Respirable Crystalline Silica Exposure Control Plan. The OSHA Respirable Crystalline Silica Standards apply to all occupational exposures to respirable crystalline silica in construction work, except where employee exposure will remain below 25 micrograms of respirable crystalline silica per cubic meter of air (25 µg/m³) as an 8-hour time-weighted average (TWA).

4. POLICY STATEMENT

West Virginia University is committed to providing a safe and healthful environment for all activities under its jurisdiction and complying with federal, state and local health and safety standards. As such, to minimize exposures to silica dust and to comply with OSHA's Silica in Construction Standard, this Respirable Crystalline Silica Exposure Control Plan shall be implemented at West Virginia University.

5. DEFINITIONS

Action Level – a concentration of airborne respirable crystalline silica of 25 ug/m³, calculated as an 8-hour time-weighted average. Exceeding this requires compliance with the OSHA Standards and the WVU Respirable Crystalline Silica Exposure Control Plan.

Assigned Protection Factor (APF) – the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program.

Competent Person – an individual who is capable of identifying existing and foreseeable respirable crystalline silica hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them.

Crystalline Silica – Silicon dioxide (SiO₂). Crystalline refers to the orientation of the SiO₂ 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.

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.

Objective data – 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.

Permissible Exposure Limit (PEL) - a concentration of airborne respirable crystalline silica of 50 ug/m³, calculated as an 8-hour time-weighted average. Exceeding this requires respiratory protection, in addition to complying with all other aspects of the OSHA standards and the WVU Respirable Crystalline 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. Typically includes particles sizes of 10 µm or less.

6. RESPONSIBILITIES

6.1. WVU Administration

The WVU Administration is responsible for ensuring the University is in compliance with acceptable Federal and State Occupational Safety and Health regulations regarding Silica in Construction Standards as stated in 29 CFR 1926.1153 and Respirable Crystalline Silica Standards as stated in 29 CFR 1910.1053, and for providing necessary funding and all other necessary resources to ensure the implementation and continuance of this program.

6.2. WVU Department Deans, Directors, Managers, and Supervisors

Deans, Directors, Managers, and Supervisors have primary responsibility for the management and enforcement for the WVU Respirable Crystalline Silica Exposure Control Plan in their areas. Those departments performing construction, renovation, maintenance, or repair work covered by this program shall:

- Provide necessary funding and all other necessary resources to ensure the implementation and continuance of this program;
- Actively support and implement this plan as part of the work units overall safety effort;
- Ensure employees comply with all provisions of this plan and the responsibilities assigned within this plan are carried out within their administrative work unit;
- Designate a competent person(s);
- Notify EHS in cases of uncontrolled releases of visible dust in occupied buildings;
- Provide engineering and work practice controls as identified in Table 1, or alternative controls, as needed;
- Schedule employee exposure assessments when necessary with the assistance of EHS;
- Schedule medical surveillance for employees, initially and then every 3 years unless sooner as identified by the PLHCP;
- Arrange for medical evaluation for respirator use, in accordance with the WVU's Respirator Program; and
- Attend all required training;
- Schedule required training and fit testing for employees through Occupational Medicine, as required by Section 14 of this program.

6.3. WVU Project Managers/WVU Personnel Who Hire External Contractors or Vendors

WVU Project Managers or personnel responsible for external contractors or vendors performing construction, renovation, maintenance, or repair work covered by this program are responsible to:

- Understand the roles and responsibilities of contractors and vendors per Section 6.8. of this plan and communicating requirements to contractors or vendors;

- Communicating silica hazards that may not be evident to the contractor or vendor;
- Ensure the following where activities conducted by contractors or vendors may or have the potential to create an exposure for WVU and students:
 - WVU affected employees are clearly notified of the hazards and methods to minimize exposures.
 - All WVU Project Managers, contractors, and vendors participate in a pre-planning meeting prior to performing construction activities.
 - Coordination between WVU Project Managers, contractors, and vendors on all construction projects.

6.4. Competent Person(s)

- Be familiar with and understand how to apply all elements of the WVU Respirable Crystalline Silica Exposure Control Plan;
- Inspect job sites, materials, and equipment frequently and regularly;
- Identify existing and foreseeable respirable crystalline silica hazards and take prompt action;
- Be available to employees for questions about or problems with dust controls;
- Notify EHS when exposure changes and reevaluation is needed;
- Attend all required trainings.

6.5. Affected Employees

- Comply with the procedures and requirements outlined in this plan;
- Conduct work activities in a manner that prevents uncontrolled disturbance of silica-containing materials and the generation of visible dust;
- Attend Silica Awareness training;
- Utilize the proper engineering controls and work practices;
- Attend Respiratory Protection Training and Fit Testing, as required in Section 14 of this program;
- Wear respiratory protection, and other PPE, as required;
- Notify supervisors of changes in the workplace that could cause an increase in exposures to respirable crystalline silica.

6.6. Environmental Health and Safety (EHS)

- Develop and maintain the WVU Respirable Crystalline Silica Exposure Control Plan;
- Develop and conduct Silica Awareness Training;
- Provide information to the University administration to support decisions on silica management, as requested;
- Provide guidance to departments to maintain compliance with regulatory requirements and university policy;
- Recommend appropriate response actions to control or eliminate potential hazards, as requested;
- Maintain training records associated with this plan;
- Conduct assessments for employee exposure determinations;
- Maintain exposure monitoring equipment.

6.7. Occupational Medicine

- Conduct medical surveillance in accordance with 29 CFR 1926.1153 and 29 CFR 1910.1053;
- Maintain records of the physical examinations, x-rays, and tests;
- Provide the employee and WVU with the PHLCP's Written Medical Opinion;
- Facilitate respirator fit testing and training, as requested.

6.8. Contractors and Vendors

Contractors and sub-contractors are responsible for complying with the OSHA's Silica in Construction Standard (29 CFR 1926.1153), OSHA's Respirable Crystalline Silica Standard (29 CFR 1910.1053), and the appropriate sections of this exposure control plan. They must also ensure:

- They comply with all local, state, and federal safety requirements.
- All of their employees and sub-contractors who perform work on WVU property have been suitable training to perform the tasks that they have been assigned.
- They provide all necessary controls, tools, and personal protective equipment for their employees to perform the tasks that they have been assigned.
- They participate in pre-planning meeting prior to performing construction activities.

7. REGULATORY REQUIREMENTS

The OSHA Silica in Construction Standard and this plan apply to all exposures that exceed the Action Level of 25 $\mu\text{g}/\text{m}^3$. Employees conducting activities that are not identified in Table 1 or that do not comply with the engineering controls identified must undergo employee exposure monitoring to determine if their exposures exceed the Action Level, without considering the use of respiratory protection. If exposures are found to exceed the Permissible Exposure Limit (PEL) of 50 $\mu\text{g}/\text{m}^3$, respiratory protection will be required for those activities.

8. COMPETENT PERSONS

Competent persons must be identified to frequently and regularly inspect job sites, materials, and equipment to implement this management plan. This person is someone who can identify existing and foreseeable respirable crystalline silica hazards and is authorized to take prompt corrective action. The competent person can be someone that is also working on the jobsite or task.

Each department employing workers affected by the OSHA Silica in Construction Standard and this management plan must identify a competent person. Affected employees must be informed of the identity of the competent person.

9. EMPLOYEE EXPOSURE MONITORING

Employees utilizing alternative control measures to those identified in Table 1, and conducting activities not represented in Table 1 where they can reasonably be expected to be exposed to respirable crystalline silica, must undergo employee exposure assessment. The purpose of the assessments is to identify where exposures are occurring, help to determine proper and effective control methods, and to prevent exposures above the PEL. The employer shall ensure

the assessment reflects the exposures of each employee on each shift, for each job classification, in each work area.

EHS can assist with determining employee exposures. If industry-wide data and historical data is not available, introductory direct-reading meters can be used to assess conditions. If employee exposure assessments are necessary, all affected employees represented by the assessment must be notified of results within 5 days of receipt by written notification or posting in a common, accessible space.

10. TASKS

The OSHA standard requires the employer to identify tasks in the workplace that involve exposure to respirable crystalline silica. The University has a number of trades over several different departments that are responsible for maintenance and renovation of WVU buildings, hardscapes, utilities and landscapes. Potential silica-containing substrates and materials encountered include but are not limited to asphalt, brick, cement, concrete, concrete block, drywall, grout, mortar, paints containing silica, plasters, rock, roof tile, sand, soil, stone, stucco, terrazzo, clay and ceramic tile. Activities impacting these materials include but are not limited to cutting/sawing, demolishing/disturbing, drilling/coring, earthmoving, grinding, jackhammering, milling, mixing/pouring, sanding, scarifying, scraping, and even clean-up activities such as sweeping and vacuuming.

OSHA has published a list of typical equipment and tasks, and necessary engineering controls and respiratory protection. This list is identified as Table 1 in the standard and can be found in Appendix A of this plan. When employers comply with the requirements of Table 1, employee exposure monitoring is not required. Integrated water delivery systems and shrouded power equipment with HEPA exhaust are the primary methods of control for all activities that disturb silica-containing materials. When these controls are not feasible or a different type of engineering control is utilized, employee exposure monitoring will be conducted to assess exposure. The equipment/tasks identified in Table 1:

- stationary masonry saws;
- handheld power saws;
- walk-behind saws;
- drivable saws;
- rig-mounted core saws and drills;
- handheld and stand-mounted drills (including impact and rotary hammer drills);
- dowel drilling rigs for concrete;
- jackhammers and power-chipping tools;
- handheld grinders for mortar removal and other uses;
- crushing machines;
- heavy equipment and utility vehicles for abrading and fracturing silica containing materials and demolition activities; and
- heavy equipment and utility vehicles for tasks such as grading and excavating.

Additionally, other activities can occur on silica-containing materials that are not represented in the Table 1 list of equipment/tasks and control measures. Such activities, include but are not limited to, scraping of painted drywall and plasters, light demolition activities involving handheld

tools and reciprocating saws, mixing and pouring, and cleanup methods. Engineering and work practice controls will be used, employee exposure monitoring will be conducted, and respiratory protection will be employed, as required in Section 14 of this program.

11. ENGINEERING AND WORK PRACTICE CONTROLS

Engineering and work practice controls must be utilized to keep employee exposures below the PEL, regardless of the use of respiratory protection. Engineering controls are more effective than respiratory protection and must be used unless such controls are not feasible (e.g., water use around electrical equipment or in indoor environments that could lead to other hazards such as mold).

Integrated water delivery systems are the most effective engineering control. 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 should not be clogged, and all hoses and connections must be intact. All manufacturer's recommendations, include flow rates, must be followed. See Table 1 in Appendix A for specific requirements for equipment/tasks.

Some equipment can be equipped with commercially available dust collection systems. In this case, the shroud or cowling must be intact, installed, and maintained 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. Some tools have additional requirements that dust collectors must provide 25 cubic feet per minute (CFM) or greater of airflow per inch of wheel diameter (such as grinders). See Table 1 in Appendix A for specific requirements for equipment/tasks.

Enclosed cabs are identified as engineering and work practices for several tasks in Table 1, including vehicle-mounted drilling rigs and other heavy equipment and utility vehicles used for abrading and fracturing silica-containing materials and grading and excavating operations. For those measures that require enclosed cabs, the cab must:

- Be maintained as free as practicable from settled dust;
- Have door seals and closing mechanisms that work properly;
- Have gaskets and seals that are in good condition and working properly;
- Be under positive pressure maintained through continuous delivery of fresh air;
- Have intake air that is filtered through a filter that is 95% efficient in the 0.3-10.0 µm range (e.g., MERV-16 or better); and
- Have heating and cooling capabilities.

For tasks not identified in Table 1, efforts will be made to utilize engineering controls such as water delivery systems and wet methods or ventilation to reduce exposures, unless not feasible.

12. HOUSEKEEPING

Clean-up activities involving respirable crystalline silica dust must be done utilizing wet methods and/or HEPA vacuums. Dry sweeping or dry brushing must not be done when such activity will

create a dust cloud. Compressed air is prohibited as a means of cleaning dust unless 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.

During activities indoors, efforts should be made to contain the dust as it is generated with the use of drop cloths and catch bags, when feasible. This will reduce potential for dust becoming airborne and aid final cleaning efforts. During final cleaning, all horizontal and vertical surfaces must be wet wiped or HEPA vacuumed. No visible dust or residue should remain.

13. RESTRICTING ACCESS

13.1. Restricted Area

When conducting work indoors, or in areas outdoors adjacent to the public, access to the work area must be restricted. Outdoors, barrier tape and/or fencing must be used to prevent access, as necessary. Visible dust must not leave the worksite. Signs must be posted to prevent others from accessing the worksite.

Indoors, additional means may be necessary to protect building occupants. First, building occupants must be notified of projects. Schedule project outside of normal working hours when area is less occupied if restricting access is problematic or if suitable air quality cannot be maintained. 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. Visible dust must not leave the worksite.

13.2. Regulated Area

A regulated area will be established where work exposures at a fixed location are known to be at or above the PEL. A regulated area must be separated from other areas in a way to minimize the number of employees exposure. 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. The following sign will be posted at the entrance to the regulated area:

DANGER
RESPIRABLE CRYSTALLINE SILICA
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION IN THIS AREA

14. RESPIRATORY PROTECTION

Respiratory protection will be required during certain activities when required by Table 1, when engineering and work practice controls are not effective enough to reduce exposure and when these controls are not feasible. Respirators will be required when exposures exceed the PEL:

- During periods necessary to install or implement feasible engineering and work practice controls;
- During tasks such as maintenance and repair where these controls are not feasible; and
- During tasks where engineering and work practice controls are not sufficient. Even when these controls are not sufficient, they still must be used to reduce exposure, in combination with respiratory protection.

Respirator use at the University must be in accordance with the OSHA Respirator Standard and WVU's Respiratory Protection Program. When respirators are required, employees must undergo a medical evaluation by Occupational Medicine, and then attend training and fit testing. These are annual requirements. Contact EHS for further information on the program, medical evaluation process, and training and fit testing.

Silica dust is a particulate so respirators with particulate filters will be selected. For most operations and tasks where respirators are required (whether as identified in Table 1 or by employee exposure assessments), those respirators that are identified as having an assigned protection factor (APF) of 10 will be selected. These respirators include properly fitted filtering facepiece respirators or dust masks with an N95 filter, or a properly fitted ½ face elastomeric respirator with HEPA (P100) cartridges.

Table 1 assigns respirators based upon the equipment/task, locations and the length of time the activity will be conducted. Often work indoors or in an enclosed area will require respiratory protection.

Voluntary use of filtering face-piece respirators, or dust masks, are allowed when exposures to silica do not exceed the PEL, and when respirators are not mandated in Table 1. Employees can choose to wear these masks for comfort purposes only. Compliance with the OSHA Respirator Standard and WVU's Respirator Program are still required.

15. MEDICAL SURVEILLANCE

Medical surveillance will be required for any employee who performs tasks that require respirators to protect against silica exposure (as indicated in Table 1) for 30 or more days a year. If the employee performs such tasks for any length of time during the day, that counts as one day of exposure.

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 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 pulmonary 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 Construction Standard;
- A description of the employee’s former, current and anticipated duties as they relate to the employee’s occupational exposure to respirable crystalline silica;
- 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 WVU department of Occupational Medicine. Call the office of Occupational Medicine at (304)293-3693 to schedule an exam. Tell the person who answers that you wish to schedule medical surveillance for crystalline silica. Once the appointment has been scheduled, contact EHS at (304)293-3792 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.

16. TRAINING

All University employees affected by these standards and exposure control plan must be trained in silica awareness. The following topics will be covered:

- 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 Construction Standard (29 CFR 1926.1153) and the OSHA Respirable Crystalline Silica Standard (29 CFR 1910.1053);
- The identity of the competent person;
- The purpose and description of the medical surveillance program; and
- The availability of the OSHA Silica in Construction Standard (29 CFR 1926.1153) and the OSHA Respirable Crystalline Silica Standard (29 CFR 1910.1053).

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, or new controls are introduced, and any time there is a deficiency in the employee's knowledge. For example, if an employee is found working without using the required engineering or work practice controls.

17. RECORDKEEPING

Records that are required to be collected and maintained under this exposure control plan include employee exposure assessments, objective data relied on for compliance, and medical surveillance. Departments must forward to EHS copies of WVU employee exposure assessment records. EHS will maintain employee exposure assessments and objective data records. Departments will need to forward copies medical surveillance records to EHS.

18. REFERENCES

- OSHA 29 CFR 1926.1153
- OSHA 29 CFR 1910.1053
- WVU Respiratory Protection Program

APPENDICES

APPENDIX A: TABLE 1