



UNIVERSITY OF
NORTHERN COLORADO

Environmental Health and Safety

Silica Management Program

For Monitoring & Controlling Employee Exposure

February 2019



UNIVERSITY OF
NORTHERN COLORADO

Environmental Health and Safety

Silica Management Program

- I. Purpose & Scope
- II. Regulation
- III. Health Advisory
- IV. Definitions
- V. Roles and Responsibilities
- VI. Program Requirements
 - a. Exposure Assessment
 - b. Regulated Areas
 - c. Written Exposure Control Plan
 - d. Engineering and Work Practice Controls
 - e. Housekeeping
 - f. Medical Surveillance
 - g. Hazard Communication
- VII. OSHA Table 1: Exposure Control Methods for Construction
- VIII. Training
- IX. Recordkeeping

Appendix A – Flowchart for Specified Exposure Controls for Table 1 Tasks

Appendix B – Flowchart for Alternative Exposure Control Methods

Appendix C – Written Exposure Control Plan Template

Appendix D – Silica Hazard Signage

Appendix E – Equipment and Engineering Controls for Dust Control



UNIVERSITY OF
NORTHERN COLORADO

Environmental Health and Safety

Silica Management Program

I. Purpose & Scope

The University of Northern Colorado (UNC) has established a Silica Management Program (SMP) as a means of educating, training, and protecting individuals from respirable crystalline silica exposure.

The purpose of this program is to establish and implement a SMP that:

- Describes the hazards associated with exposure to silica dust from performing specific employee tasks and work practices
- Explains the steps taken to ensure employees working with or around silica are not exposed to hazardous levels of silica dust
- Provides procedures to minimize exposures for common silica related tasks

This program applies to all individuals at UNC who work with silica-containing materials and/or employees who are at risk for silica exposure based on their proximity to work that generates silica dust. This includes working on construction activities as well as performing general industry tasks.

II. Regulation

The Occupational Safety and Health Administration's (OSHA) standards for this standard include:

- General Industry Standard - **29 CFR 1910.1053**
- Construction Standard - **29 CFR 1926.1153**

III. Health Advisory

Overexposure to Crystalline Silica in an occupational setting is significantly associated with two major negative human health effects:

1. Crystalline Silica is a known human carcinogen.

Exposure of workers to respirable crystalline silica is associated with elevated rates of lung cancer. The most significant link between human

lung cancer and respirable crystalline silica exposure was observed in quarry and granite workers, as well as workers involved in ceramic, pottery, or brick and mortar work

2. Occupational exposure to respirable silica dust is known to cause Silicosis.

Silicosis is the most commonly reported health impact associated with occupational exposure to silica dust. Silicosis is a disease of the lungs that causes significant scarring of lung tissues, resulting in reduced lung function. This disease is debilitating and potentially fatal with no known cure.

Additionally, smoking has an additive effect for workers who are exposed to silica dust. This is because smoking itself causes damage to the lungs and decreases lung function temporarily, preventing the lungs from expelling silica dust as the worker is breathing.

IV. Definitions

Assigned Protection Factor (APF) - The workplace level of respiratory protection that a respirator is expected to provide to employees.

Time Weighted Average (TWA) - an average exposure over a specified period, usually a nominal eight hours.

Action Level - An airborne concentration of respirable crystalline silica equaling 25 $\mu\text{g}/\text{m}^3$, calculated as an 8-hour TWA. Exposures at or above the action level trigger requirements for exposure assessment.

Known Human Carcinogen - A substance that is known to cause cancer in living tissue.

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 the hazards. The competent person must have the knowledge and ability necessary to implement the written exposure control plan required under the standard.

Dust Collection System – The use of a shroud or cowling around the tool bit or cutting zone that works with a vacuum to collect silica dust as it is produced during cutting operations.

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

Engineering Controls – Modifications put in place to eliminate or reduce exposure to a chemical or physical hazard through the use or substitution of engineered machinery or equipment that ensures controls are in place, are properly operated and maintained, and employees understand how to use them.

Half-Face Elastomeric Respirator- A tight-fitting, air-purifying respirator with replaceable filters (for particulates), cartridges, or canisters (for gases and vapors). In either case, these are attached to a rubber or silicone face piece that covers the nose and mouth. This type of respirator needs to be fit tested and can be used instead of a filtering face piece respirator.

High-Efficiency Particulate Air (HEPA) Filter - A filter that is at least 99.97 percent efficient in removing monodispersed particles of 0.3 micrometers in diameter. A P100 or N100 cartridge meets the definition of HEPA.

Permissible Exposure Limit (PEL) - A legal limit in the US for exposure of an employee to a chemical substance or physical agent. For respirable crystalline silica, this means an airborne concentration of 50 $\mu\text{g}/\text{m}^3$ or 0.05 mg/m^3 , calculated as an 8-hour Time Weighted Average (TWA).

N-95 Respirator - A respiratory protective device that looks similar to a regular dust mask, but that is designed to achieve a very close facial fit and very efficient filtration of airborne particles. The 'N95' designation means that when subjected to careful testing, the respirator blocks at least 95 percent of very small (0.3 micron) test particles.

Overexposure – An exposure to airborne respirable crystalline silica that exceeds the permissible exposure limit, and thus poses an increased risk to human health.

Personal Protective Equipment (PPE) - Protective clothing, helmets, goggles, respiratory protection, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter.

Respirable Crystalline silica – Respirable-sized particles of a hard, unreactive, colorless compound that occurs as the mineral quartz and as a principal constituent of sandstone and other rocks.

Silicosis – A disease causing lung fibrosis, or the scarring and damage of connective tissues cause by the inhalation of dust containing silica.

Water Delivery/ Wet Methods - Methods that deliver continuous water to suppress dust while performing a task. This is often seen as integrated systems that continuously delivers water to the saw blade

Work Practices - changes in work procedures such as written safety policies, rules, supervision, schedules, and training with the goal of reducing the duration, frequency, and severity of exposure to hazardous chemicals or situations

V. Roles and Responsibilities

1. Environmental Health and Safety (EHS)

EHS provides program oversight and consultation to UNC employees and departments regarding potential risks, exposure prevention and training relating to silica dust exposure. One or more EHS employees will be trained and certified as the designated competent person for construction tasks.

2. Department Heads

Department heads shall ensure that the supervisor(s) understand their responsibilities for the preparation and implementation of the Silica Exposure Control Plan within each/all working group(s). The department head should be actively supportive of their supervisor by helping to provide an environment where all employees follow this written program.

3. Supervisors

UNC employees who supervise personnel with responsibilities to work in areas where there is a risk of exposure to silica dust, shall ensure their employees are properly trained on the applicable contents of the Silica Dust Safety Program and are provided appropriate PPE when conducting such work.

4. Employees

Employees shall comply with the written silica exposure control program as well as any written exposure control plans, and any further safety recommendations provided by supervisors. It is vital that employees contact their supervisor to request technical assistance and to evaluate any health and safety concerns they have within their department.

VI. Program Requirements

1. Exposure Assessment

a. Initial Exposure Assessment

- i. Exposure assessment will be conducted on any employee who is or may reasonably be expected to be exposed to respirable crystalline silica at or above the action level (excluding tasks listed on Table 1).

- ii. Some activities that may have an exposure risk are: working with geological survey, sand blasting, art involving ceramics, and ground and landscaping crews.
- iii. Exposure assessment is not required if the task is listed in 29 CFR 1926.1153(c)(1) and the engineering controls, work practices, and PPE listed are used as listed. (See Table 1)

b. Periodic Exposure Assessment

- i. Periodic qualitative exposure assessment shall be conducted whenever the task (excluding those in Table 1) is being performed indoors or if the exposure is suspected to be at or above the action level.
- ii. Qualitative exposure assessments should be performed regularly by supervisors, and should evaluate all aspects of the task being performed (proper use of PPE, sufficient respiratory protection, the use of appropriate and effective engineering controls).

c. Reassessment of Exposures

- i. 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, monitoring should be conducted.
- ii. New written exposure assessments shall be completed when any changes are made to a task (excluding those in Table 1).

d. Employee Notification

- i. If quantitative exposure assessments and/or sampling is required, the employee shall be notified within 15 workdays of receiving the sampling results.
- ii. If results show the PEL has been exceeded for a given task, the notification will include the recommended medical, or protective measures for each effected employee.

2. Regulated Areas

Anywhere the exposure is above the PEL, a regulated area will be established. The regulated area must be separated from other areas in a way to minimize the number of employees exposed.

Only employees who have work to perform in the area are allowed to enter the regulated area. All employees entering the regulated area must wear a respirator, regardless of the amount of time spent in the area.

3. Written Exposure Control Plan

For each area that has an exposure over the action level (excluding tasks on Table 1), a written exposure control plan (Appendix C) shall be developed. The exposure control plan includes a description of the task(s) being conducted that involve(s) silica and all of the controls that are in place to minimize potential employee exposures.

4. Engineering and Work Practice Controls

Anywhere the exposure is above or suspected to be above the PEL, 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.

5. Housekeeping

Cleaning of silica dust should be conducted with primarily HEPA-filtered vacuum cleaners, but also using wet sweeping methods. These methods will minimize the likelihood of exposure. Only if other methods are not feasible can compressed air and/or dry sweeping be used.

6. Medical Surveillance

Prior to the use of a respirator while performing silica work, all UNC employees working around silica shall be deemed medically fit by a licensed medical professional. UNC's Respiratory Protection Program states, "using a respirator may place a physiological burden on faculty, staff and students that varies with the type of respirator worn, the job and workplace conditions in which the respirator is used, and the medical status of each individual. Prior to respirator use faculty, staff and students assigned to specific tasks requiring the use of any respiratory protective device must be cleared by a medical professional prior to work being performed (initial clearance or baseline) and annually thereafter. A determination of the physical capability to perform the required work while wearing respiratory devices is also necessary."

Medical testing related to medical surveillance should be conducted at a reasonable time and place, and at no cost to the employee. Medical testing may include:

- Comprehensive history of medical and work history, with an emphasis on the past, present, and anticipated exposure to respirable crystalline silica, dust, and other agents that affect the respiratory system; any history of respiratory system dysfunctions,

including signs and symptoms of respiratory disease.

- Physical Examination emphasizing the respiratory system.
- Diagnostic testing such as Pulmonary Function Testing, Tuberculosis Screening, and Chest X-Rays. These tests will likely be performed to assess medical fitness to wear a respirator, and then repeated every three years following the initial testing.

7. Hazard Communication

Silica must be included in the department's hazard communication program. This includes, but is not limited to, properly labeling and having a Safety Data Sheet (SDS).

Signs shall be posted outside areas where silica dust is present. Appendix D shows the appropriate signage for communicating hazards associated with performing silica tasks.

VII. OSHA Table 1: Exposure Control Methods for Construction

1. Unlisted Tasks

If you're exposed to respirable crystalline silica and engaged in a task using equipment and machines not identified in the following list, contact your supervisor or EHS for assistance with filling out a Written Exposure Control Plan, determining the engineering controls, work practices, and respiratory protection needed to complete the task safely.

2. Housekeeping Tasks:

Do not use dry sweeping or dry brushing for cleanup or housekeeping tasks where that activity may contribute to employee exposure to respirable crystalline silica.

Do not use compressed air to clean clothing or surfaces where such activity could contribute to employee exposure to respirable crystalline silica.

Employees must use HEPA-Filtered Vacuuming whenever possible and wet sweeping in cases where a HEPA vacuum is not appropriate or available.

Employees must wear respiratory protection throughout the duration of housekeeping tasks or activity where such activity could contribute to employee exposure to respirable crystalline silica.

3. Table 1 Listed Tasks:

For each employee engaged in a silica task identified in Table 1 of the Respirable Crystalline Silica standard, employees will fully and properly implement the engineering controls, work practices, and respiratory protection specified for the task listed in Table 1.

1926.1153(c)(1) - Table 1

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
(i) Stationary masonry saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions	None	None
(ii) Handheld power saws (any blade diameter)	Use saw equipped with integrated water delivery system that continuously feeds water to the blade Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions:		
	-When used outdoors	None	APF 10
	-When used indoors or in an enclosed area	APF 10	APF 10
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)	For tasks performed outdoors only: Use saw equipped with commercially available dust collection system Operate and maintain tool in	None	None

	accordance with manufacturer's instructions to minimize dust emissions Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency		
(iv) Walk-behind saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions:		
	-When used outdoors	None	None
	-When used indoors or in an enclosed area	APF 10	APF 10
(v) Drivable saws	For tasks performed outdoors only:		
	Use saw equipped with integrated water delivery system that continuously feeds water to the blade Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions	None	None
(vi) Rig-mounted core saws or drills	Use tool equipped with integrated water delivery system that supplies water to cutting surface Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions	None	None

(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills)	<p>Use drill equipped with commercially available shroud or cowling with dust collection system</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions</p> <p>Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism</p> <p>Use a HEPA-filtered vacuum when cleaning holes</p>	None	None
(viii) Dowel drilling rigs for concrete	For tasks performed outdoors only:		
	Use shroud around drill bit with a dust collection system. Dust collector must have a filter with 99% or greater efficiency and a filter-cleaning mechanism	APF 10	APF 10
(ix) Vehicle-mounted drilling rigs for rock and concrete	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	None	None
	OR		
	Operate from within an enclosed cab and use water for dust suppression on drill bit	None	None
	Use tool with water delivery system that supplies a continuous stream or spray		

(x) Jackhammers and handheld powered chipping tools	of water at the point of impact:		
	-When used outdoors	None	APF 10
	-When used indoors or in an enclosed area	APF 10	APF 10
	OR		
	Use tool equipped with commercially available shroud and dust collection system		
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism:		
	-When used outdoors	None	APF 10
	-When used indoors or in an enclosed area	APF 10	APF 10
(xi) Handheld grinders for mortar removal (<i>i.e.</i> , tuckpointing)	Use grinder equipped with commercially available shroud and dust collection system	APF 10	APF 25
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	Dust collector must provide 25 cubic feet per minute		

	(cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism		
(xii) Handheld grinders for uses other than mortar removal	For tasks performed outdoors only: Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	OR		
	Use grinder equipped with commercially available shroud and dust collection system		
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism:		
	-When used outdoors	None	None

	-When used indoors or in an enclosed area	None	APF 10
(xiii) Walk-behind milling machines and floor grinders	Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	OR		
	Use machine equipped with dust collection system recommended by the manufacturer	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism		
	When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes		
(xiv) Small drivable milling machines (less than half-lane)	Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant	None	None

	Operate and maintain machine to minimize dust emissions		
(xv) Large drivable milling machines (half-lane and larger)	For cuts of any depth on asphalt only: Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust	None	None
	Operate and maintain machine to minimize dust emissions		
	For cuts of four inches in depth or less on any substrate:		
	Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust	None	None
	Operate and maintain machine to minimize dust emissions		
	OR		
	Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant	None	None
	Operate and maintain machine to minimize dust emissions		
(xvi) Crushing machines	Use equipment designed to deliver water spray or mist for dust suppression at	None	None

	crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points)		
	Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions		
	Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station		
(xvii) Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials	Operate equipment from within an enclosed cab	None	None
	When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions	None	None
(xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: Demolishing, abrading, or fracturing silica-containing materials	Apply water and/or dust suppressants as necessary to minimize dust emissions	None	None
	OR		
	When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab	None	None

Where an employee performs more than one task in Table 1 during the course of the shift, and the total duration of all tasks combined is more than four hours, the required respiratory protection for each task will be the respiratory protection specified for more than four hours per shift. If the total duration of all tasks in Table 1 combined is less than four hours, the required respiratory protection for each task will be the respiratory protection specified for less than four hours.

VIII. Training

EHS will schedule silica training sessions, however it is the responsibility of the supervisor to ensure all employees who may be exposed to silica dust have received proper training and know the training requirements.

Awareness Training

Awareness level training is designed for departments (Facilities Management, Housing and Residential Education, Information Management and Technology, etc) who work around or perform tasks that produce silica dust. The employee shall attend a silica awareness training session annually.

Employees will also receive Respiratory Protection Program and Hazard Communication Training as part of the mandatory training requirements.

IX. Recordkeeping

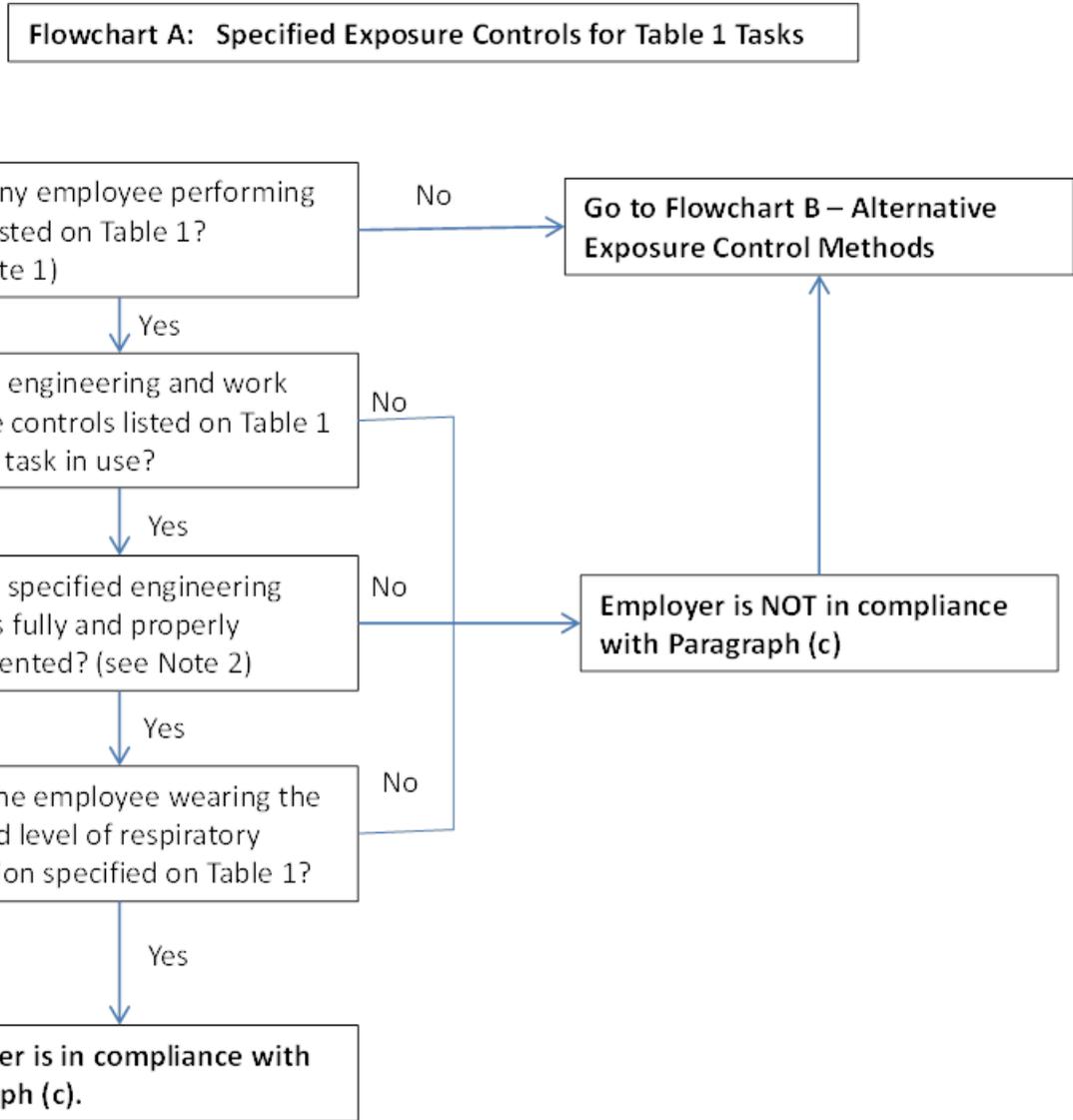
Training and assessment records will be maintained by EHS. Survey information includes sampling and analytical methods; type of PPE, if any, in use at the time of sampling; and the monitoring results.

Records will be maintained for at least 30 years following termination of an employee's employment.

Each employee is able to obtain information on his/her exposure and medical examinations through the Human Resource Department.

Appendix A:

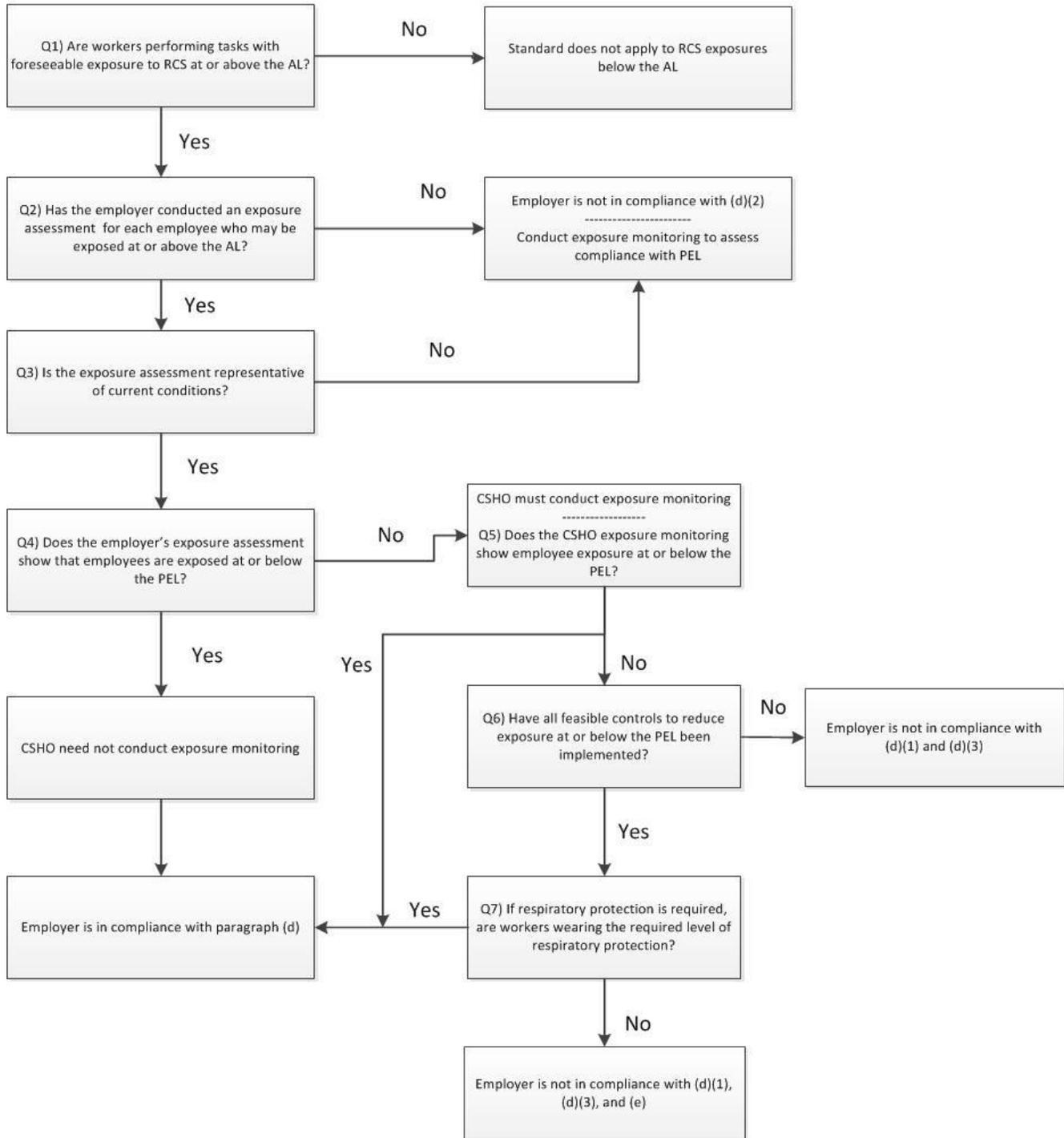
Flowchart for Specified Exposure Controls for Table 1 Tasks



Appendix B:

Flowchart for Alternative Exposure Control Methods

Flowchart B- Alternative Exposure Control Methods



Appendix C:



UNIVERSITY OF
NORTHERN COLORADO

Environmental Health and Safety

**UNC WRITTEN EXPOSURE CONTROL PLAN
For Silica-Producing Tasks Not in OSHA's Table 1**

LOCATION:	REVIEW DATE:
EMPLOYEE:	DEPARTMENT:
SUPERVISOR:	WORK ORDER #:

DESCRIPTION OF TASK(S):

--

ENGINEERING CONTROLS:

--

WORK PRACTICES:

--

RESPIRATORY PROTECTION USED:

--

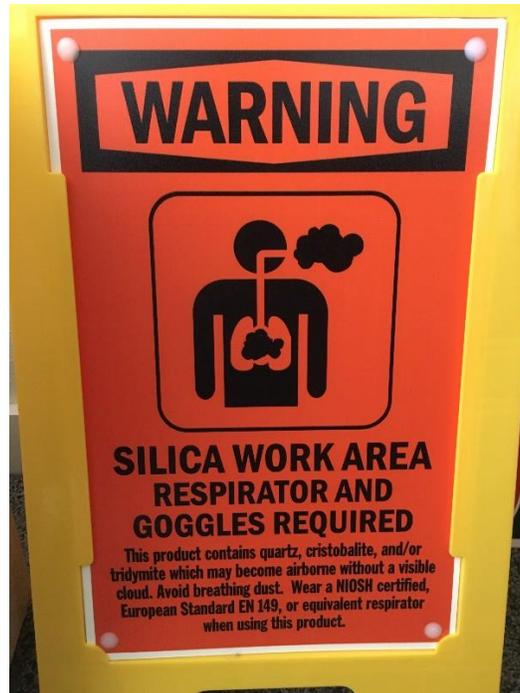
HOUSEKEEPING METHODS:

--

Turn in Completed form to Environmental Health and Safety

Appendix D:

Silica Hazard Signage



Appendix E:

Equipment and Engineering Controls for Dust Control

COMING SOON...LIST OF ALL EQUIPMENT