

# 851>Cal/OSHA Implementation Plan: Respirable Crystalline Silica

This form is for documenting changes to a program and the program’s supporting resources (ESH Manual chapter or similar program description, training courses, databases, and so on) resulting from the adoption of the model Revolutionary Working Group (RWG) contract (see below) and the associated DOE variance from 10 CFR 851, “Worker Safety and Health Program”. The purpose is to ensure consistent, concise descriptions of the resulting changes. The form is to be completed by the program manager and sent to the DOE as a cover sheet with the revised documents. The general process is as follows:

1. Program manager completes form
2. Changes to program resources made and reviewed following normal revision processes
3. DOE sent draft form and revisions
4. Changes to program resources published
5. DOE sent final form and revisions

## 1 Introduction

The RWG model contract and 10 CFR 851 variance are intended to simplify and improve the implementation of worker safety and health requirements by tailoring the laws, regulations, and standards that apply while achieving a level of protection equivalent to the requirements of 10 CFR 851. This mostly entails replacing federal Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1910 and 1926) with Cal/OSHA regulations (8 CCR) as external requirements to be complied with but may also involve other laws and regulations and either different versions of industry standards than those cited in 10 CFR 851 or entirely different standards. (One purpose of this form is to capture the specific changes in external requirements for each program.) (For more information on this effort, see the variance application in [851>Cal/OSHA](#) resources.)

## 2 Plan

Field Number	Field Name	Field
1.	Program name	<a href="#">Respirable Crystalline Silica</a>
2.	Program manager	<a href="#">McDaniel, Mike</a>
3.	LBNL counterpart	Harreschou, Samuel Jacob ( <a href="#">SME list</a> ) ( <a href="#">LBNL Phonebook</a> )
4.	Program documents	<p><i>The following is a list of existing program documents, to be reviewed by the program manager to determine which will need to be revised to reflect 851&gt;Cal/OSHA changes.</i></p> <ul style="list-style-type: none"><li>▪ <a href="#">ESH Manual Chapter 56: Respirable Crystalline Silica</a></li><li>▪ <a href="#">Respirable Crystalline Silica: Quick Start Summary</a></li><li>▪ <a href="#">Respirable Crystalline Silica: General Requirements</a></li><li>▪ <a href="#">Respirable Crystalline Silica: Handheld and Stand-mounted Drill Work Plan</a></li><li>▪ <a href="#">Respirable Crystalline Silica: Rig-mounted Core Saw or Drill Work Plan</a></li></ul>
5.	Training courses	<p><i>The following is a list of existing training courses, to be reviewed by the program manager to determine which will need to be revised to reflect 851&gt;Cal/OSHA changes.</i></p> <p><i>Course materials are available for review.</i></p>

Field Number	Field Name	Field
		<ul style="list-style-type: none"> <li>▪ ESH Course 148, Respirable Crystalline Silica Safety (<a href="#">ESH Course 148</a>)</li> <li>▪ ESH Course 148ME, Respirable Crystalline Silica Medical Surveillance (<a href="#">ESH Course 148ME</a>)</li> </ul>
6.	Other program resources	<p>The following is a list of existing program resources, to be reviewed by the program manager to determine which will need to be revised to reflect 851&gt;Cal/OSHA changes.</p> <ul style="list-style-type: none"> <li>▪ <a href="#">Crystalline Silica Exposure Control SharePoint Site</a></li> <li>▪ <a href="#">Competent and Qualified Persons and Engineers</a></li> <li>▪ <a href="#">Industrial Hygiene Document Database</a></li> <li>▪ <a href="#">Industrial Hygiene</a></li> </ul>
7.	Current external requirements	<p>The following is a list of current external requirements for this program, as identified in the program documents above.</p> <ul style="list-style-type: none"> <li>▪ <a href="#">29 CFR 1926.1153</a></li> </ul>
8.	Proposed external requirements	<p>List all the external requirements that will apply to this program. To determine, start by looking up existing external requirements in <a href="#">851&gt;Cal/OSHA</a> resources (variance, gap analysis, and contract) and finding replacements (for example a specific section in 29 CFR 1910 to a specific section in 8 CCR or a current version of an industry standard). Where Cal/OSHA requirements are less stringent than those of 10 CFR 851, check with Jeremy Sawyer on which to use. <b>Enter “no changes” if none.</b></p> <ul style="list-style-type: none"> <li>▪ 8 CCR 5204. Occupational Exposures to Respirable Crystalline Silica</li> <li>▪ 29 CFR 1926.1153, Table 1</li> </ul>
9.	Proposed substantive changes	<p>Describe (list) the substantive changes to be made in the program, based on the new external requirements. <b>Enter “no changes” if none.</b></p> <ul style="list-style-type: none"> <li>▪ No changes</li> </ul>
10.	Additional proposed substantive changes	<p>Describe (list) the substantive changes to be made in the program, in addition to those based on the new external requirements. For example, those due to stakeholder input, other reviews and audits, operating experience. <b>Enter “no changes” if none.</b></p> <ul style="list-style-type: none"> <li>▪ No changes</li> </ul>
11.	Affected program documents	<p>List program documents affected by the changes above. <b>Enter “no changes” if none.</b></p> <ul style="list-style-type: none"> <li>▪ ESH Manual Ch 56 change references from federal to Cal/OSHA throughout</li> </ul>
12.	Affected training courses	<p>List training courses affected by the changes above. <b>Enter “no changes” if none.</b></p> <ul style="list-style-type: none"> <li>▪ ESH Course 148, Respirable Crystalline Silica Safety (ESH Course 148)</li> <li>▪ ESH Course 148ME, Respirable Crystalline Silica Medical Surveillance (ESH Course 148ME)</li> </ul>
13.	Other affected program resources	<p>List other program resources affected by the changes above. <b>Enter “no changes” if none.</b></p> <ul style="list-style-type: none"> <li>▪ No changes</li> </ul>
14.	Comments/questions/issues	<p>Add any comments or questions regarding applicable requirements or changes.          [ Add text ]</p>
15.	Status	<input checked="" type="checkbox"/> Initial draft (proposed changes) <input checked="" type="checkbox"/> Draft (for DOE review) <input checked="" type="checkbox"/> Final (published changes)
16.	Date completed	11/21/2019(revised 4/21/2020)      5/11/2020      7/26/2020

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 56: [Respirable Crystalline Silica](#)

## Quick Start Summary

Product ID: [696](#) | Revision ID: 2243 | Date published: 26 July 2020 | Date effective: 26 July 2020

URL: <https://www-group.slac.stanford.edu/esh/eshmanual/references/silicaQuickstart.pdf>

### 1 Who needs to know about these requirements

The requirements of Respirable Crystalline Silica apply to workers potentially exposed to airborne concentrations of respirable crystalline silica, their supervisors, competent persons, subcontractors, and the respirable crystalline silica program manager; and Waste Management and the Occupational Health Center.

### 2 Why

*Respirable crystalline silica* (quartz, cristobalite, and/or tridymite contained in airborne particles) poses a serious health hazard, being associated with cancer and damage to the lungs, kidneys, and immune system.

### 3 What do I need to know

Cutting, drilling, grinding, coring, and other abrasive operations on concrete are potential sources of airborne silica, as are operations on sheetrock, surfaces painted with low volatile organic compounds, tile, brick, some insulation products, and silica-containing mortar, paints, or insulation.

To limit worker exposure, standard controls, such as the use of water at the working surface, mechanical ventilation, and approved vacuums to control dust, are generally adequate. In some cases respirators may be required. When these controls may not be adequate, an exposure assessment must be conducted. Medical surveillance is required for any worker required to wear a respirator 30 or more days a year for silica-related work. When performing airborne-silica generating tasks, the control methods to be used must be documented, workers who perform silica-related tasks must be trained, and the disposal of waste must be coordinated with Waste Management.

### 4 When

These requirements take effect 26 July 2020.

### 5 Where do I find more information

[SLAC Environment, Safety, and Health Manual](#) (SLAC-I-720-0A29Z-001)

- [Chapter 56, “Respirable Crystalline Silica”](#)

Or contact the [program manager](#).



## Chapter 56

# Respirable Crystalline Silica

Product ID: [695](#) | Revision ID: [2242](#) | Date published: 26 July 2020 | Date effective: 26 July 2020

URL: <https://www-group.slac.stanford.edu/esh/eshmanual/pdfs/ESHch56.pdf>

## 1 Purpose

The purpose of this program is to ensure that worker exposure to *respirable crystalline silica* remains below the *permissible exposure limit (PEL)* and that material containing silica is properly handled and disposed of. It covers all work that could cause the release of silica, such as demolition or drilling of concrete or work with materials that contain silica. It applies to workers potentially exposed to airborne concentrations of respirable crystalline silica, their supervisors, *competent persons*, subcontractors, and the respirable crystalline silica program manager; and Waste Management and Occupational Health.

This chapter constitutes SLAC's written respirable silica exposure control plan required by [8 CCR 5204](#).

## 2 Roles and Responsibilities

Functional roles and general responsibilities for each are listed below. More detailed responsibilities and when they apply are provided in the procedures and requirements.

The roles may be performed by one or more individuals and one individual may play more than one role, depending on the structure of the organizations involved. Responsibilities may be delegated.

### 2.1 Worker

- Is familiar with the hazards and controls required to perform the work safely
- Follows the requirements of this chapter and its supporting materials when performing silica-related tasks that could expose him or her to airborne silica
- Completes required training
- Uses required personal protective equipment (PPE)

### 2.2 Competent Person

- Is designated by subcontractor, or if a SLAC worker, by the respirable crystalline silica program manager in consultation with line management
- Has a working knowledge of [8 CCR 5204](#)
- Is capable of identifying silica hazards
- Determines whether an exposure assessment is required

- Recommends and implements engineering and work practice controls
- Establishes levels of personal protective equipment (PPE)
- Has the authority to take action to eliminate hazards and correct incidences of non-compliance

## 2.3 Supervisor

- Ensures that a hazard evaluation is performed in accordance with the requirements of this program and that required controls are in place before authorizing work
- Ensures the control methods to be used are documented, in work planning and control documents such as a job safety analysis (JSA), activity training and authorization (ATA), or standard operating procedure (SOP) (see [Chapter 2, “Work Planning and Control”](#)), or in a penetration permit (see [Chapter 44, “Penetration Safety”](#)) or other appropriate document
- Ensures silica control equipment, including vacuums certified as *high-efficiency particulate air (HEPA)* compliant, is available and used properly
- Discusses the hazards and controls with workers and verifies that the workers are trained and qualified to perform the work before authorizing the work
- Ensures area/building managers, subcontractors, and other personnel working in the immediate area are notified of silica generating activities
- Ensures silica waste characterization and disposal is coordinated with Waste Management
- Assigns training to workers who perform silica-related tasks that could expose them to airborne silica
- Assigns *medical surveillance* to workers required by this program to wear respirators for 30 days or more per year
- Approves designation by the respirable crystalline silica program manager of SLAC competent persons

## 2.4 Subcontractor

- Designates a respirable crystalline silica competent person and ensures that person carries out all required duties
- Has own [8 CCR 5204](#)-compliant written silica exposure control plan for their employees potentially exposed due to work activities, submitted to SLAC as part of their site-specific safety plan (see [Chapter 42, “Subcontractor Safety”](#)).
- Trains workers in silica control as required by [8 CCR 5204](#)
- Implements a medical surveillance program for their own employees
- Ensures silica control equipment, including vacuums certified as HEPA compliant, is available and used properly

## 2.5 Occupational Health Center

- Provides medical surveillance
- Relays written results of examinations to affected worker within 30 days
- Maintains medical records

## 2.6 Waste Management Group

- Coordinates disposal of all waste and ensures waste packaging and transportation meet applicable regulatory requirements

## 2.7 Respirable Crystalline Silica Program Manager

- Is a respirable crystalline silica competent person
- Designates SLAC competent persons in consultation with line management
- Maintains silica designations in the [Competent and Qualified Persons and Engineers](#) list
- Conducts exposure assessments when needed:
  - Determines the need for initial and additional exposure monitoring
  - Records results in the [Industrial Hygiene Document Database](#)
  - Makes results available to the affected workers within 15 working days after completion, in accordance with [8 CCR 5204 \(d\)\(6\)\(A\)](#)
- Develops requirements and guidance as appropriate
- Periodically monitors activities for compliance
- Reviews and evaluates this program for effectiveness at least annually, in accordance with [8 CCR 5204 \(f\)\(2\)\(B\)](#)

## 3 Procedures, Processes, and Requirements

These documents list the core requirements for this program and describe how to implement them:

- [Respirable Crystalline Silica: General Requirements](#) (SLAC-I-730-0A09C-010). Describes general requirements for identifying hazards and selecting and implementing controls
- [Respirable Crystalline Silica: Handheld and Stand-mounted Drill Work Plan](#) (SLAC-I-730-0A09C-011). Describes requirements for work with handheld and stand-mounted drills (including impact, rotary hammer, and other drill types)
- [Respirable Crystalline Silica: Rig-mounted Core Saw or Drill Work Plan](#) (SLAC-I-730-0A09C-012). Describes requirements for work with rig-mounted core saws and drills

Additional information for implementing these requirements is available from the [Crystalline Silica Exposure Control Program Site](#) (SharePoint).

## 4 Training

The following training requirements apply to SLAC personnel only; subcontractor personnel must have completed all training required by the laws and regulations applicable to the work they will be performing (see [Chapter 42, “Subcontractor Safety”](#)).

## 4.1 Worker

Workers who perform silica-related tasks that could expose them to airborne silica must complete

- ESH Course 148, Respirable Crystalline Silica Safety ([ESH Course 148](#))

Workers who are required under this program to wear a respirator 30 days or more a year must complete

- ESH Course 148ME, Respirable Crystalline Silica Medical Surveillance ([ESH Course 148ME](#))

## 4.2 Competent Person

Competent persons must complete

- ESH Course 148, Respirable Crystalline Silica Safety ([ESH Course 148](#))

## 5 Definitions

*action level.* A concentration for a specific substance, generally one half of the PEL, that initiates certain required activities such as exposure monitoring and medical surveillance. The action level for respirable crystalline silica is one half of the PEL, or  $25 \mu\text{g}/\text{m}^3$ , calculated as an eight-hour time-weighted average.

*competent person.* An individual who is capable of identifying existing and foreseeable hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them

*high-efficiency particulate air (HEPA) filter.* A filter capable of removing from the air at least 99.97 percent of dust, pollen, mold, bacteria, and any airborne particles with a size of  $0.3 \mu\text{m}$  or larger

*medical surveillance.* A formal regime for monitoring the medical condition of workers

*permissible exposure limit (PEL).* An exposure limit published and enforced by the federal Occupational Safety and Health Administration (OSHA) as a legal standard. A PEL may be either a time-weighted-average (TWA) exposure limit (eight hour), a 15-minute short-term exposure limit (STEL), or a ceiling (C), and may have a skin designation. The PEL for respirable crystalline silica is  $50 \mu\text{g}/\text{m}^3$ , calculated as an eight-hour time-weighted average.

*respirable crystalline silica.* Quartz, cristobalite, and/or tridymite contained in airborne particles that are determined to be respirable

## 6 References

### 6.1 External Requirements

The following are the external requirements that apply to this program:

- Title 8, *California Code of Regulations*, “Industrial Relations”, Division 1, “Department of Industrial Relations”, Chapter 4, “Division of Industrial Safety”, Subchapter 7, “General Industry Safety Orders”,



Group 16, “Control of Hazardous Substances, “Article 110, “Regulated Carcinogens”, Section 5204, “Occupational Exposures to Crystalline Silica” ([8 CCR 5204](#))

- Title 29, *Code of Federal Regulations*, “Labor”, Subtitle B, “Regulations Relating to Labor (Continued)”, Chapter 17, “Occupational Safety and Health Administration, Department of Labor (Continued)”, Part 1926, “Safety and Health Regulations for Construction”, Subpart Z, “Toxic and Hazardous Substances”, Section 1153, “Respirable Crystalline Silica”, Subsection C, “Specified Exposure Control Methods”, Table 1, “Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica” ([29 CFR 1926.1153\[c\] Table 1](#))

## 6.2 Related Documents

[SLAC Environment, Safety, and Health Manual](#) (SLAC-I-720-0A29Z-001)

- [Chapter 2, “Work Planning and Control”](#)
- [Chapter 27, “Asbestos”](#)
- [Chapter 29, “Respiratory Protection”](#)
- [Chapter 42, “Subcontractor Safety”](#)
- [Chapter 44, “Penetration Safety”](#)

Other SLAC Documents

- [Industrial Hygiene](#)
- [Industrial Hygiene Document Database](#)
- [Competent and Qualified Persons and Engineers](#)

Other Documents

- None



Chapter 56: [Respirable Crystalline Silica](#)

## General Requirements

Product ID: [697](#) | Revision ID: 2244 | Date published: 26 July 2020 | Date effective: 26 July 2020

URL: <https://www-group.slac.stanford.edu/esh/eshmanual/references/silicaReqGeneral.pdf>

### 1 Purpose

The purpose of these requirements is to ensure that worker exposure to *respirable crystalline silica* remains below the *permissible exposure limit (PEL)* and that material containing silica is properly handled and disposed of. They cover all work that could cause the release of silica, such as demolition or drilling of concrete or work with materials that contain silica. They apply to workers potentially exposed to airborne concentrations of respirable crystalline silica, their supervisors, *competent persons*, subcontractors, and the respirable crystalline silica program manager; and Waste Management and Occupational Health.

### 2 Requirements

#### 2.1 Hazard Identification and Control Selection

Cutting, drilling, grinding, coring, and other abrasive operations on concrete are potential sources of airborne silica, as are operations on sheetrock, surfaces painted with low volatile organic compounds, tile, brick, some insulation products, and silica-containing mortar, paints, or insulation. Where process knowledge indicates the presence of silica, the controls required by Table 1 in [29 CFR 1926.1153\(e\)](#) will be implemented or an exposure assessment will be conducted in accordance with [8 CCR 5204 \(d\)](#) and controls used based on the results.

*Note*      *The exposure assessment includes an initial determination, which may be based on “any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures”, including data from manufacturers or other third parties on the efficacy of silica control measures, or on “scheduled monitoring” (8 CCR 5204 (d)(3)).*

##### 2.1.1 Table 1

Table 1 in [29 CFR 1926.1153](#) (reproduced here as Table 1) lists common airborne silica generating activities, the required controls, and required levels of respiratory protection. Generally the controls in Table 1 are adequate to limit exposure for the activities listed and no further analysis is necessary.

The primary silica generating activities performed by SLAC workers involve the use of handheld drills, stand-mounted core drills, and rotary hammers. These activities can be completed using the dust control methods called out in Table 1 without requiring the use of respirators.

[Respirable Crystalline Silica: Handheld and Stand-mounted Drill Work Plan](#) and [Respirable Crystalline Silica: Rig-mounted Core Saw or Drill Work Plan](#) are Table 1-compliant work plans for these activities.

**Table 1** Silica-generating Equipment/tasks, Controls, and Respiratory Protection (29 CFR 1926.1153[c] 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: <ul style="list-style-type: none"> <li>▪ When used outdoors</li> <li>▪ When used indoors or in an enclosed area</li> </ul>	None APF 10	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: <ul style="list-style-type: none"> <li>▪ Use saw equipped with commercially available dust collection system</li> <li>▪ Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions</li> </ul> Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency	None	None
(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: <ul style="list-style-type: none"> <li>▪ When used outdoors</li> <li>▪ When used indoors or in an enclosed area</li> </ul>	None APF 10	None APF 10
(v) Drivable saws	For tasks performed outdoors only: <ul style="list-style-type: none"> <li>▪ Use saw equipped with integrated water delivery system that continuously feeds water to the blade</li> </ul> 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

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours /shift
(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	<p>For tasks performed outdoors only:</p> <p>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.</p> <p>Use a HEPA-filtered vacuum when cleaning holes</p>	APF 10	APF 10
(ix) Vehicle-mounted drilling rigs for rock and concrete	<p>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</p>	None	None
	<p>or</p> <p>Operate from within an enclosed cab and use water for dust suppression on drill bit</p>	None	None
(x) Jackhammers and handheld powered chipping tools	<p>Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact</p> <ul style="list-style-type: none"> <li>▪ When used outdoors</li> <li>▪ When used indoors or in an enclosed area</li> </ul>	None	APF 10
	<p>or</p> <p>Use tool equipped with commercially available shroud and 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> <ul style="list-style-type: none"> <li>▪ When used outdoors</li> <li>▪ When used indoors or in an enclosed area</li> </ul>	APF 10	APF 10

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours /shift
(xi) Handheld grinders for mortar removal (ie, tuckpointing)	<p>Use grinder equipped with commercially available shroud and 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 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.</p>	APF 10	APF 25
(xii) Handheld grinders for uses other than mortar removal	<p>For tasks performed outdoors only:</p> <p>Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <hr/> <p>or</p> <p>Use grinder equipped with commercially available shroud and 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 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</p> <ul style="list-style-type: none"> <li>▪ When used outdoors</li> <li>▪ When used indoors or in an enclosed area.</li> </ul>	None	None
(xiii) Walk-behind milling machines and floor grinders	<p>Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions</p>	None	None

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours /shift
	Or Use machine equipped with dust collection system recommended by the manufacturer 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	None	None
(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 Operate and maintain machine to minimize dust emissions	None	None
(xv) Large drivable milling machines (half-lane and larger)	For cuts of any depth on asphalt only: <ul style="list-style-type: none"> <li>▪ Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust</li> <li>▪ Operate and maintain machine to minimize dust emissions</li> </ul>	None	None
	For cuts of four inches in depth or less on any substrate: <ul style="list-style-type: none"> <li>▪ Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.</li> <li>▪ Operate and maintain machine to minimize dust emissions.</li> </ul>	None	None
	Or Use a machine equipped with supplemental water spray designed to suppress dust Water must be combined with a surfactant Operate and maintain machine to minimize dust emissions	None	None

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours /shift
(xvi) Crushing machines	Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (eg, 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	None	None
(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 workers 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

For each task above, the engineering controls, work practices, and respiratory protection specified must be fully and properly implemented. When implementing these measures,

- For tasks performed indoors or in enclosed areas, a means of exhaust must be provided as needed to minimize the accumulation of visible airborne dust
- For tasks performed using wet methods, water must be applied at flow rates sufficient to minimize the release of visible dust
- For measures implemented that include an enclosed cab or booth, the enclosed cab or booth
  - 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 percent efficient in the 0.3–10.0 µm range (for example, MERV-16 or better)
- Have heating and cooling capabilities

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

## 2.1.2 Exposure Assessment

If not following Table 1 or if performing an activity not identified in Table 1, when workers may be exposed to airborne silica at or above the *action level* (one half of the PEL, or 25 µg/m<sup>3</sup> calculated as an eight-hour time-weighted average), an exposure assessment must be conducted by a competent person to determine the extent to which workers are exposed and the appropriate exposure controls required. The exposure assessment must meet these requirements:

- An initial determination of exposure must be made at the beginning of operations. This determination may be based on “any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures”, including data from manufacturers or other third parties on the efficacy of silica control measures, or on “scheduled monitoring” ([8 CCR 5204 \(d\)\(3\)](#)).
- If scheduled monitoring is used,
  - The determination must consist of the collection of personal air samples representative of a full shift, including at least one sample for each job classification in each work area, either for each shift or for the shift with the highest exposure level.
  - During the initial determination, until such time that actual airborne concentrations are determined, personnel must be protected by respiratory protection based on task- specific anticipated airborne concentrations of silica.
  - During the initial determination, and in addition to the respiratory protection required, personnel must be provided with protective clothing and equipment, hygiene facilities, and training.
  - When an assessment determines that exposure has occurred above the action level but below the PEL, additional monitoring must be required at least every six months. Additional monitoring must continue until such time that the monitoring results fall below the action level on two separate occasions at least seven days apart.
  - When monitoring yields results above the PEL, then quarterly monitoring is required. The quarterly monitoring may be suspended when additional monitoring results fall below the action level on two separate occasions at least seven days apart.
- In the absence of air monitoring or objective data, where the competent person can clearly demonstrate that a work activity will not create airborne silica concentrations in excess of the action level, scheduled monitoring may be unwarranted. Where a negative initial determination is reached without air monitoring, the competent person must develop a written explanation as to why exposures are not expected to exceed the action level.

Whenever a change in equipment, process, or controls occurs, or a new task has been initiated, an additional exposure assessment is required.

Exposure assessments will be recorded in the [Industrial Hygiene Document Database](#). The results of the assessment will be used by the competent person to select required controls, which must be documented in the relevant work planning and control documents (see Section 2.2). In addition the assessment will be made available to the affected workers within 15 working days after completion, in accordance with [8 CCR 5204 \(d\)\(6\)\(A\)](#).

## 2.2 Control Methods

When performing airborne-silica generating tasks, the control methods to be used (as determined above) must be documented, in work planning and control documents such as a job safety analysis (JSA), activity training and authorization (ATA), or standard operating procedure (SOP) (see [Chapter 2, “Work Planning and Control”](#)), or in a penetration permit (see [Chapter 44, “Penetration Safety”](#)) or other appropriate document.

Engineering and work practice controls, including administrative controls, must be implemented to the extent feasible to reduce and maintain employee exposure to silica at or below the PEL. Where all feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PEL, respiratory protection will also be required (see Section 2.2.2).

The following sections provide additional detail on control methods.

### 2.2.1 Housekeeping

All surfaces must be maintained as free as possible from accumulations of silica. Methods for cleaning surfaces and floors that minimize the likelihood of silica becoming airborne (such as using a *high-efficiency particulate [HEPA]* vacuum or wet sweeping) must be selected. Dry sweeping is only allowed if other methods are not feasible.

#### 2.2.1.1 Vacuum Cleaners

If vacuuming is the housekeeping method selected, vacuums with HEPA filtration are required.

HEPA vacuums used for silica control must undergo annual emery oil aerosol or equivalent challenge testing and be certified as in passing condition before work commencing. Vacuum testing must include checking around the exhaust vents and the canister/filter housing seals. Before a third-party vendor performs HEPA filter testing, it is advised that the vacuum cleaner owner change the collection bag and inspect the unit for wear and damage.

Subcontractors must have their silica-control HEPA vacuum cleaners undergo HEPA filter efficiency testing, as described above, before use at SLAC. The date of the vacuum testing must be no earlier than a year before the end of the SLAC project. Documentation of third-party certification of HEPA filter efficiency must be provided to the SLAC project manager.

The following requirements apply to the disposal of dust from vacuums:

- Respiratory protection must be worn when emptying contents of vacuum cleaners.
- Vacuum contents must be contained and disposed of in bags that can effectively hold dust without breaking.

- Silica waste characterization and disposal must be coordinated with Waste Management. Waste Management will determine if any special handling is required because of contamination or activation due to previous activities. Generally debris does not require special handling beyond that stated above.
- Workers must not leave the workplace wearing any protective clothing or equipment that is required to be worn during their work shift without first using a HEPA vacuum to remove dust.

## 2.2.2 Personal Protective Equipment (PPE)

Respiratory protection must be used for the following conditions:

- When required in order to comply with Table 1
- For work operations where engineering and work practice controls are not sufficient to reduce employee exposure to or below the PEL
- During periods when respirators are required to provide interim protection while conducting initial exposure determination

Respiratory protection must be selected based on guidance in Table 1 or on a certified industrial hygienist's or competent person's assessment of the potential airborne exposure that may be created by the means and methods of work (high-energy operations with high airborne dust generation or low-energy operations with low dust generation).

For information on how to obtain and use respirators, including required training, see [Chapter 29, "Respiratory Protection"](#).

Disposable coveralls are recommended when clothing may become contaminated with dust or slurry.

## 3 Forms

The following are forms required by these requirements:

- None

## 4 Recordkeeping

The following recordkeeping requirements apply for these requirements:

- The competent person will record exposure assessments in the [Industrial Hygiene Document Database](#) and make the assessment available to the affected workers within five working days
- The Occupational Health Center will relay written results of examinations to affected worker within 30 days and maintain the medical records

## 5 References

[SLAC Environment, Safety, and Health Manual](#) (SLAC-I-720-0A29Z-001)

- [Chapter 56, "Respirable Crystalline Silica"](#)

- [Respirable Crystalline Silica: Handheld and Stand-mounted Drill Work Plan](#) (SLAC-I-730-0A09C-011). Describes requirements for work with handheld and stand-mounted drills (including impact, rotary hammer, and other drill types)
- [Respirable Crystalline Silica: Rig-mounted Core Saw or Drill Work Plan](#) (SLAC-I-730-0A09C-012). Describes requirements for work with rig-mounted core saws and drills
- [Crystalline Silica Exposure Control Program Site](#) (SharePoint)
- [Chapter 2, “Work Planning and Control”](#)
- [Chapter 29, “Respiratory Protection”](#)
- [Chapter 44, “Penetration Safety”](#)

#### Other SLAC Documents

- [Industrial Hygiene](#)

#### Other Documents

- Title 8, *California Code of Regulations*, “Industrial Relations”, Division 1, “Department of Industrial Relations”, Chapter 4, “Division of Industrial Safety”, Subchapter 7, “General Industry Safety Orders”, Group 16, “Control of Hazardous Substances”, “Article 110, “Regulated Carcinogens”, Section 5204, “Occupational Exposures to Crystalline Silica” ([8 CCR 5204](#))
- Title 29, *Code of Federal Regulations*, “Labor”, Subtitle B, “Regulations Relating to Labor (Continued)”, Chapter 17, “Occupational Safety and Health Administration, Department of Labor (Continued)”, Part 1926, “Safety and Health Regulations for Construction”, Subpart Z, “Toxic and Hazardous Substances”, Section 1153, “Respirable Crystalline Silica”, Subsection C, “Specified Exposure Control Methods”, Table 1, “Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica” ([29 CFR 1926.1153\[c\] Table 1](#))

Chapter 56: [Respirable Crystalline Silica](#)

## Handheld and Stand-mounted Drill Work Plan

Product ID: [698](#) | Revision ID: 2245 | Date published: 26 July 2020 | Date effective: 26 July 2020

URL: <https://www-group.slac.stanford.edu/esh/eshmanual/references/silicaReqDrillHandheld.pdf>

### 1 Purpose

The purpose of these requirements is to ensure that worker exposure to *respirable crystalline silica* remains below the *permissible exposure limit (PEL)* and that material containing silica is properly handled and disposed of. They cover work with handheld and stand-mounted drills (including impact, rotary hammer, and other drill types) that could cause the release of silica. They apply to workers and supervisors.

### 2 Requirements

1. Use drill equipped with commercially available shroud or cowling with dust collection system
2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions
3. Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99 percent or greater efficiency and a filter-cleaning mechanism
4. Use a *high-efficiency particulate air (HEPA)*-filtered vacuum when cleaning holes
5. Immediately follow drilling with HEPA vacuuming of area
6. Use standard construction site personal protective equipment (PPE): safety glasses, hearing protection, and dust mask
7. If there is no integrated dust collection as described above, then a half-face respirator with HEPA cartridges is required until air sampling has been performed to characterize silica exposure with the tools and controls utilized.
8. Respiratory protection must be worn when emptying contents of silica vacuum cleaners. Vacuum contents must be disposed of in bags that can effectively hold dust without breaking.
9. Contact Waste Management for waste characterization before disposal





Chapter 56: [Respirable Crystalline Silica](#)

## Rig-mounted Core Saw or Drill Work Plan

Product ID: [699](#) | Revision ID: 2246 | Date published: 26 July 2020 | Date effective: 26 July 2020

URL: <https://www-group.slac.stanford.edu/esh/eshmanual/references/silicaReqDrillRig.pdf>

### 1 Purpose

The purpose of these requirements is to ensure that worker exposure to *respirable crystalline silica* remains below the *permissible exposure limit (PEL)* and that material containing silica is properly handled and disposed of. They cover work with rig-mounted core saws and drills that could cause the release of silica. They apply to workers and supervisors.

### 2 Requirements

1. Use tool equipped with integrated water delivery system that supplies water to cutting surface
2. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions
3. Use standard construction site personal protective equipment (PPE): safety glasses, hearing protection, and dust mask
4. Clean up slurry immediately
5. If required to rough out interior of core drill penetration, use a drill with integrated dust collection mechanism or shroud and
  1. Immediately follow drilling with high-efficiency particulate air (HEPA) vacuuming of penetration and of general area
  2. If there is no integrated dust collection, then a half-face respirator with HEPA cartridges is required until air sampling has been performed to characterize silica exposure with the tools and controls utilized.
6. Respiratory protection must be worn when emptying contents of silica vacuum cleaners. Vacuum contents must be disposed of in bags that can effectively hold dust without breaking.
7. Contact Waste Management for waste characterization before disposal

