Chapter 56: Respirable Crystalline Silica

Quick Start Summary

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URL: http://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 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 4 December 2017.

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

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 program manager; and Waste Management and Occupational Health.

This chapter constitutes SLAC’s written respirable silica exposure control plan required by 29 CFR 1926.1153.

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 29 CFR 1926.1153
- Is capable of identifying silica hazards
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 29 CFR 1926.1153-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 29 CFR 1926.1153
- 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
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 five working days after completion, in accordance with 29 CFR 1926.1153(d)(2)(vi)
- Develops requirements and guidance as appropriate
- Periodically monitors activities for compliance
- Reviews and evaluates this program for effectiveness at least annually, in accordance with 29 CFR 1926.1153(g)(2)

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

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

filter, high-efficiency particulate air (HEPA). 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 µm or larger.

level, action. 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 µg/m³, calculated as an eight-hour time-weighted average.

limit, permissible exposure (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 µg/m³, calculated as an eight-hour time-weighted average.

person, competent. 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.

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

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

6 References

6.1 External Requirements

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


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

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 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 will be implemented or an exposure assessment will be conducted in accordance with 29 CFR 1926.1153(d)(2) 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” (29 CFR 1926.1153(d)(2)).

2.1.1 Table 1

Table 1 of 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>
<thead>
<tr>
<th>Equipment / Task</th>
<th>Engineering and Work Practice Control Methods</th>
<th>Required Respiratory Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Stationary masonry saws</td>
<td>Use saw equipped with integrated water delivery system that continuously feeds water to the blade</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions</td>
<td>None</td>
</tr>
<tr>
<td>(ii) Handheld power saws (any blade diameter)</td>
<td>Use saw equipped with integrated water delivery system that continuously feeds water to the blade</td>
<td>None APF 10</td>
</tr>
<tr>
<td></td>
<td>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• When used outdoors</td>
<td>APF 10</td>
</tr>
<tr>
<td></td>
<td>• When used indoors or in an enclosed area</td>
<td></td>
</tr>
<tr>
<td>(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)</td>
<td>For tasks performed outdoors only:</td>
<td>None APF 10</td>
</tr>
<tr>
<td></td>
<td>• Use saw equipped with commercially available dust collection system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency</td>
<td></td>
</tr>
<tr>
<td>(iv) Walk-behind saws</td>
<td>Use saw equipped with integrated water delivery system that continuously feeds water to the blade</td>
<td>None APF 10</td>
</tr>
<tr>
<td></td>
<td>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• When used outdoors</td>
<td>APF 10</td>
</tr>
<tr>
<td></td>
<td>• When used indoors or in an enclosed area</td>
<td></td>
</tr>
<tr>
<td>(v) Drivable saws</td>
<td>For tasks performed outdoors only:</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• Use saw equipped with integrated water delivery system that continuously feeds water to the blade</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions</td>
<td></td>
</tr>
<tr>
<td>(vi) Rig-mounted core saws or drills</td>
<td>Use tool equipped with integrated water delivery system that supplies water to cutting surface</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions</td>
<td></td>
</tr>
<tr>
<td>Equipment / Task</td>
<td>Engineering and Work Practice Control Methods</td>
<td>Required Respiratory Protection and Minimum Assigned Protection Factor (APF)</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
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<td>--------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| (vii) Handheld and stand-mounted drills (including impact and rotary hammer drills) | Use drill equipped with commercially available shroud or cowling with 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  
Use a HEPA-filtered vacuum when cleaning holes                                                                                                                               | ≤ 4 hours/shift: None  
> 4 hours/shift: 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  
Use a HEPA-filtered vacuum when cleaning holes                                                                                                                                  | 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  
or  
Operate from within an enclosed cab and use water for dust suppression on drill bit                                                                                                 | None  
None                                                                                                                   |
| (x) Jackhammers and handheld powered chipping tools                                                                                                                           | Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact  
- When used outdoors: None  
- When used indoors or in an enclosed area: 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  
- When used indoors or in an enclosed area: APF 10                                                               | None  
APF 10  
APF 10                                                                                                                 |
### Equipment / Task

#### (xi) Handheld grinders for mortar removal (ie, tuckpointing)

- **Engineering and Work Practice Control Methods**
  - 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.

- **Required Respiratory Protection and Minimum Assigned Protection Factor (APF)**
  - ≤ 4 hours/shift: APF 10
  - > 4 hours/shift: APF 25

#### (xii) Handheld grinders for uses other than mortar removal

- **Engineering and Work Practice Control Methods**
  - For tasks performed outdoors only:
    - Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface.
    - 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
      - When used indoors or in an enclosed area: APF 10

#### (xiii) Walk-behind milling machines and floor grinders

- **Engineering and Work Practice Control Methods**
  - Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface
  - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions

- **Required Respiratory Protection and Minimum Assigned Protection Factor (APF)**
  - None
### Required Respiratory Protection and Minimum Assigned Protection Factor (APF)

<table>
<thead>
<tr>
<th>Equipment / Task</th>
<th>Engineering and Work Practice Control Methods</th>
<th>≤ 4 hours/shift</th>
<th>&gt; 4 hours /shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>or</td>
<td>Use machine equipped with dust collection system recommended by the manufacturer</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(xiv) Small drivable milling machines (less than half-lane)</td>
<td>Use a machine equipped with supplemental water sprays designed to suppress dust</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Water must be combined with a surfactant</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operate and maintain machine to minimize dust emissions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(xv) Large drivable milling machines (half-lane and larger)</td>
<td>For cuts of any depth on asphalt only:</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>- Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Operate and maintain machine to minimize dust emissions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>For cuts of four inches in depth or less on any substrate:</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>- Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Operate and maintain machine to minimize dust emissions</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>or</td>
<td>None</td>
<td>None</td>
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<td></td>
<td>Use a machine equipped with supplemental water spray designed to suppress dust</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Water must be combined with a surfactant</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Operate and maintain machine to minimize dust emissions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Equipment / Task

<table>
<thead>
<tr>
<th>Equipment / Task</th>
<th>Engineering and Work Practice Control Methods</th>
<th>≤ 4 hours/shift</th>
<th>&gt; 4 hours/shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>(xvi) Crushing machines</td>
<td>Use equipment designed to deliver water spray or mist for dust suppression at 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.</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>(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</td>
<td>Operate equipment from within an enclosed cab When workers outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>(xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: demolishing, abrading, or fracturing silica-containing materials</td>
<td>Apply water and/or dust suppressants as necessary to minimize dust emissions When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

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/m³ 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” (29 CFR 1926.1153(d)(2)).

- 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 five working days after completion, in accordance with 29 CFR 1926.1153(d)(2)(vi).

### 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

• Chapter 2, “Work Planning and Control”
• Chapter 29, “Respiratory Protection”
• Chapter 44, “Penetration Safety”

Other SLAC Documents

• Industrial Hygiene

Other Documents

Chapter 56: Respirable Crystalline Silica

Handheld and Stand-mounted Drill Work Plan

Product ID: 698 | Revision ID: 1981 | Date published: 4 December 2017 | Date effective: 4 December 2017
URL: http://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

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