

**North Carolina Department of Labor  
Occupational Safety and Health Division**

**Raleigh, NC**

Field Information System

CPL 02-02-080

***Subject:*** Inspection Procedures for Respirable Crystalline Silica Standards

A. **Discussion.**

This Instruction establishes inspection procedures and enforcement policies for the Respirable Crystalline Silica Standards, 29 CFR § 1910.1053 and 29 CFR § 1926.1153.

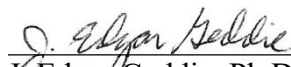
B. **Action.**


References to federal administrators or supervisors will mean the appropriate OSH Division management person. References to CPL 02-00-150, Field Operations Manual (FOM) will mean the NCDOL OSH Division FOM. Additionally, the OSH Division does not have a de minimis citation category. Also, references to the Salt Lake City Technical Center will mean the OSH Division contract laboratory.

The sampling method discussed in Appendix B of CPL 02-02-080 uses Dorr-Oliver nylon cyclones at an air flow rate of 1.7 liters per minute. The OSH Division contract laboratories use NIOSH Method 7500 for the analysis of respirable crystalline silica samples. In addition to the use of nylon cyclones at a flow rate of 1.7 liters per minute (L/min), this sampling and analytical method specifies the use of Higgins-Dewell cyclones at a flow rate of 2.2 L/min and aluminum cyclones at a flow rate of 2.5 L/min. Accordingly, Health Compliance Officers will be permitted to conduct sampling using other cyclones when set at the specified flow rates.

C. **Effective Date.**

This CPL is effective on the date of signature. It will remain in effect until revised or canceled by the director.

  
J. Edgar Geddie, Ph.D.  
Health Standards Officer

  
Kevin Beauregard  
Director

12/9/2020  
Date of Signature



# OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR

Occupational Safety and Health Administration

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**DIRECTIVE NUMBER:** CPL 02-02-080

**EFFECTIVE DATE:** 06/25/2020

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**SUBJECT:** Inspection Procedures for the Respirable Crystalline Silica Standards

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## ABSTRACT

- Purpose:** This Instruction establishes inspection procedures and enforcement policies for the Respirable Crystalline Silica Standards, [29 CFR § 1910.1053](#) and [29 CFR § 1926.1153](#).
- Scope:** This Instruction applies OSHA-wide.
- References:**
- Federal Register, [81 FR at 16285-16890](#), 29 CFR §§ 1910, 1915, 1926, *Occupational Exposure to Respirable Crystalline Silica; Final Rule*, March 25, 2016.
- OSHA Instruction, [CPL 02-00-164](#) *Field Operations Manual (FOM)*, April 14, 2020.
- OSHA Instruction [CPL 02-00-158](#), *Inspection Procedures for the Respiratory Protection Standard*, June 26, 2014.
- OSHA Instruction [CPL 02-02-079](#), *Inspection Procedures for the Hazard Communication Standard (HCS 2012)*, July 9, 2015.
- OSHA Instruction [TED 01-00-015](#), *OSHA Technical Manual (OTM)-Section II: Sampling, Measurement Methods and Instruments, Chapters 1-3*, February 11, 2014.
- OSHA Instruction [ADM 04-00-003](#), *OSHA Safety and Health Management System*, May 6, 2020.
- Cancellations:** None.
- State Impact:** Notice of intent required. States are expected to have accessible enforcement policies and procedures in place which are at least as effective as those in this Instruction.

**Action Offices:** OSHA National, Regional and Area Offices, and On-Site Consultation Programs.

**Originating Office:** Directorate of Enforcement Programs  
**Contact:** Office of Health Enforcement  
Directorate of Enforcement Programs  
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By and Under the Authority of

LOREN SWEATT  
Principal Deputy Assistant Secretary

## **Executive Summary**

This new Instruction establishes OSHA's field inspection and enforcement procedures designed to ensure uniformity when addressing respirable crystalline silica exposures in the workplace. These two new expanded health standards, general industry/maritime (29 CFR § 1910.1053) and construction (29 CFR § 1926.1153), were published in the Federal Register on March 25, 2016, and became effective June 23, 2016.

The two new standards adopted a new permissible exposure limit (PEL) of 50 micrograms of respirable crystalline silica per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ) as an 8-hour time-weighted average. Except as noted below, general industry and maritime employers had until June 23, 2018, to comply with the requirements of 29 CFR § 1910.1053.

Beginning on June 23, 2018, general industry and maritime employers must have offered medical surveillance to employees who will be exposed above the PEL for 30 or more days a year. On June 23, 2020, this requirement expanded to include employees who would be exposed at or above the 25  $\mu\text{g}/\text{m}^3$  action level (AL) for 30 or more days a year. Additionally, the obligation to implement engineering controls to limit exposures in hydraulic fracturing operations in the oil and gas industry to the new PEL do not commence until June 23, 2021. Until that time, hydraulic fracturing employers must provide employees exposed to respirable crystalline silica in hydraulic fracturing operations with respiratory protection and ensure its use if employee exposures exceed the PEL.

Construction industry employers were scheduled to be in compliance with all the standard's provisions, except for methods of sample analysis in paragraph (d)(2)(v), by June 23, 2017. However, on April 6, 2017, OSHA extended the initial compliance date to September 23, 2017. The compliance date for the methods of sample analysis requirements in paragraph (d)(2)(v) remain unchanged; as of June 23, 2018, construction industry employers must be in compliance with that provision.

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## **I. Purpose.**

The purpose of this Instruction is to provide guidelines and establish uniform inspection and enforcement procedures for the respirable crystalline silica standards. The two silica standards, 29 CFR § 1910.1053 (General Industry and Maritime) and 29 CFR § 1926.1153 (Construction), published in the *Federal Register/ Vol. 81 No. 58/ Friday March 25, 2016*, became effective on June 23, 2016.

## **II. Scope.**

This Instruction applies OSHA-wide.

## **III. References.**

- A. Federal Register, [81 FR at 16285-16890](#), 29 CFR §§ 1910, 1915, 1926, *Occupational Exposure to Respirable Crystalline Silica; Final Rule* March 25, 2016. <https://www.gpo.gov/fdsys/pkg/FR-2016-03-25/pdf/2016-04800.pdf>.
- B. OSHA Instruction [CPL 02-00-164](#), *Field Operations Manual (FOM)*, April 14, 2020. <https://www.osha.gov/enforcement/directives/cpl-02-00-164>.
- C. OSHA Instruction [CPL 02-00-158](#), *Inspection Procedures for the Respiratory Protection Standard*, June 26, 2014. <https://www.osha.gov/enforcement/directives/cpl-02-00-158>.
- D. OSHA Instruction [CPL 02-02-079](#), *Inspection Procedures for the Hazard Communication Standard (HCS 2012)*, July 9, 2015. <https://www.osha.gov/enforcement/directives/cpl-02-02-079>.
- E. OSHA Instruction [TED 01-00-015](#), *OSHA Technical Manual—Section II: Sampling, Measurement Methods and Instruments*, Chapters 1- 3, February 11, 2014. <https://www.osha.gov/dts/osta/otm/index.html>.  
[Note, some information in this document does not reflect OSHA's respirable crystalline silica rule published on March 25, 2016.]
- F. OSHA Instruction [CPL 02-02-072](#), *Rules of agency practice and procedure concerning OSHA access to employee medical records*, August 22, 2007. <https://www.osha.gov/enforcement/directives/cpl-02-02-072>.
- G. OSHA Frequently Asked Questions (FAQs) for Occupational Exposure to Respirable Crystalline Silica in General Industry/Maritime ([GI FAQs](#)) and Construction ([CON FAQs](#)).  
<https://www.osha.gov/dsg/topics/silicacrystalline/SilicaGeneralIndustryFAQs.pdf>.  
<https://www.osha.gov/dsg/topics/silicacrystalline/SilicaConstructionFAQs.pdf>.

- H. OSHA Instruction [ADM 04-00-003](https://www.osha.gov/enforcement/directives/adm-04-00-003), *Safety and Health Management System*, May 6, 2020.  
<https://www.osha.gov/enforcement/directives/adm-04-00-003>.

**IV. Cancellations.** None.

**V. Action Offices.**

- A. Responsible Office. Directorate of Enforcement Programs (DEP), Office of Health Enforcement (OHE).
- B. Action Offices. National, Regional and Area Offices, State Plan and State Consultation Offices.
- C. Information Offices. OSHA National Office.

**VI. Federal Program Change.**

Notice of Intent and Equivalency Required. This Instruction describes a federal program change that establishes policies and procedures necessary for the enforcement of the silica standards. State Plans are required to establish enforcement policies and procedures that are at least as effective as those in this Instruction and are available for review. Within 60 days of the date of issuance of this Instruction, State Plans must submit a notice of intent indicating if the State Plan will adopt policies and procedures identical to those in this Instruction or will adopt or maintain policies and procedures that are different from the federal program.

If the State Plan adopts or maintains policies and procedures that differ from the federal program, the State Plan must identify the differences and either post its policies and procedures on its website and provide a link to OSHA, or submit an electronic copy to OSHA with information on how the public may obtain a copy. State Plan adoption, either identical or different, shall be accomplished within 6 months. Documentation of State Plan adoption, and the date of adoption, must be provided to OSHA within 60 days of the date on which the State Plan adopts the new procedures or decides to maintain its own inspection procedures. If the State adopts identical policies and procedures, it must provide the date of adoption to OSHA within 60 days of the date of adoption.

OSHA will post summary information of the State Plan responses to this Instruction on its website ([www.osha.gov](http://www.osha.gov)).

**VII. Significant Changes.**

- A. This Instruction outlines the changes in enforcement due to the publication of the silica standards in the Federal Register, 81 FR at 16285 (Mar. 25, 2016). The silica standards establish a PEL of 50 µg/m<sup>3</sup> and an action level (AL) of 25 µg/m<sup>3</sup> for the three major forms of crystalline silica (i.e., quartz, cristobalite, and



tridymite<sup>1</sup>) for the general, maritime, and construction industries.

- B. The new PEL represents a change from the preceding PELs, which were based on formulas and were inconsistent between industries and forms of silica. This change is particularly significant with regard to the preceding PEL for the construction and shipyard industries, which was based on a particle count method, expressed in terms of millions of particles per cubic foot (mppcf), and required the use of a conversion factor to yield results reported in mg/m<sup>3</sup>.

## VIII. **Background.**

The term “silica” refers broadly to the mineral compound silicon dioxide (SiO<sub>2</sub>), which can be crystalline or amorphous in molecular structure. The silica standards apply only to crystalline silica—not amorphous silica. Quartz is the most common form of crystalline silica, and cristobalite is also sometimes encountered in the workplace (e.g., refractory bricks containing quartz can convert to cristobalite when subjected to prolonged high temperatures). The silica standards focus on the health effects related to the inhalation of respirable dust, which is generally defined as particles that are capable of reaching the gas-exchange region of the lung (i.e., particles less than 10 microns (µm) in aerodynamic diameter).

Exposure to crystalline forms of silica is associated with a number of health effects, including silicosis (an irreversible and potentially deadly lung disease), lung cancer, other non-malignant respiratory diseases (such as chronic bronchitis, emphysema, or chronic obstructive pulmonary disease), kidney disease, immunological effects, and activation of latent tuberculosis (TB) infections. Crystalline silica has been classified as a Group 1 carcinogen—Carcinogenic to Humans—by the International Agency for Research on Cancer (IARC) [IARC, 2012], <https://monographs.iarc.fr>. The National Toxicology Program (NTP) has also listed respirable crystalline silica as a known human carcinogen since 2000 [NTP, 2016], <https://ntp.niehs.nih.gov/annualreport/2016>. [Appendix D](#) of this Instruction provides further information on silica, including its sources and industrial uses, as well as on the adverse health effects of silica exposure.

Occupational exposure to crystalline silica occurs in a variety of workplace settings, including mining, manufacturing, construction, and shipyards. Processes associated with high rates of silica exposure include sandblasting, sand-casting in foundry operations, tunneling, cement cutting and demolition of concrete, working with masonry, and cutting and grinding of stone and artificial stone.

Reducing and ultimately eliminating the workplace-related incidence of silicosis has been a primary goal of OSHA since its inception. In 1972, OSHA issued guidelines for conducting inspections in workplaces with significant crystalline silica exposure. In the early 1980s, OSHA placed a special emphasis on the prevention of silicosis in foundries,

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<sup>1</sup> *Tridymite is rarely found in nature and rarely reported in the workplace.*

and in 1996 OSHA implemented a Special Emphasis Program (SEP) to reduce the workplace incidence of silicosis. Twelve years later, on January 24, 2008, OSHA implemented a National Emphasis Program (NEP) to identify and reduce or eliminate the health hazards associated with occupational exposure to crystalline silica. Due to the new 2016 standard, OSHA cancelled the 2008 NEP on October 26, 2017. A revised silica NEP was issued in FY 2020.

The two new silica standards, 29 CFR § 1910.1053 for general industry/maritime and § 1926.1153 for construction, provide equivalent protection for workers, to the extent feasible, while taking into account the variety of work activities and anticipated exposures and conditions that occur in these industries.

## **IX. Inspection Procedures.**

### **A. Scope and Application.**

1. The silica standards, 29 CFR § 1910.1053 (for general industry/maritime) and 29 CFR § 1926.1153 (for construction), apply to all occupational exposures to respirable crystalline silica, with some limited exceptions. The silica standards do not cover exposure to amorphous forms of silica, such as silica gel. There are certain other exemptions and exclusions from these standards as noted in this Instruction.
2. The general industry/maritime standard applies to shipyard employment ([29 CFR § 1915](#)) through cross-reference in 29 CFR § 1915.1053). While OSHA does not anticipate silica exposure in marine terminals or longshoring operations, if there is exposure, 29 CFR § 1910.1053 is applicable through [29 CFR § 1917.1\(a\)\(2\)\(xiii\)](#) and 29 CFR § 1918.1(b)(9), respectively, which reference [29 CFR § 1910, Subpart Z](#). Therefore, compliance with the silica standard under 29 CFR § 1910.1053 is required at marine terminals and longshoring facilities where silica exposure exists.
3. The general industry/maritime silica standard does not apply to construction as defined in [29 CFR § 1910.12\(b\)](#).
4. The general industry/maritime silica standard does not apply to agricultural operations covered under [29 CFR Part 1928](#).
5. The general industry/maritime silica standard does not apply to exposures that result from processing of sorptive clays.

**Note:** Sorptive clays are a discreet subset of deposits found in certain regions of the U.S. that exists as either amorphous silica or as geologically ancient, occluded quartz. Although the silica standard does not apply to exposures that result from the processing, packaging, and distribution of

sorptive clays, 29 CFR § 1910.1000 Table Z-3, the preceding general industry PEL (i.e., the formula that is approximately equivalent to 100 µg/m<sup>3</sup>) continues to apply to sorptive clay exposures. The PEL for sorptive clays should be calculated as specified in Table Z-3.

6. The silica standard also allows general industry and maritime employers to comply with the construction standard (29 CFR § 1926.1153), instead of the general industry and maritime silica standard, in certain circumstances. Specifically, 29 CFR § 1910.1053 does not apply to general industry and maritime employers if *all* the following conditions are met:
  - a. The employer complies with all applicable provisions of the construction standard (29 CFR § 1926.1153).
    - For example, the employer must comply with requirements in 29 CFR § 1926.1153(g) to designate a competent person to implement the written exposure control plan.
  - b. The task performed is *indistinguishable* from a construction task listed on Table 1-Specified Exposure Control Methods (29 CFR § 1926.1153(c)).
    - *Indistinguishable tasks* are those performed primarily during maintenance and repair activities in general industry or maritime settings, and involve a task described in the construction standard's Table 1. These tasks must be of the same nature and type as those in construction.
      - An example of an indistinguishable task is using a handheld drill during repair or maintenance of existing power delivery lines, which is considered a general industry task. This task is indistinguishable from using a handheld drill during the installation of new power delivery lines, which is a construction task.
  - c. The task will not be performed regularly in the same environment and conditions. This exception is intended for situations where the tasks will be performed in different environments and conditions, rather than in a stable and predictable environment.
    - For example, an employer whose business includes chipping out concrete from inside the drums of ready-mixed concrete trucks using pneumatic chipping tools would be engaged in a task that will be regularly performed in a relatively stable and predictable environment. Such activity is not covered by Table 1, which is intended in part to accommodate situations where the tasks will be

performed in different environments and conditions. Another example is the sanding or cutting of concrete blocks in a concrete block manufacturing plant because the task is performed regularly in the same environment and conditions.

**Note 1:** This exemption applies *by task*. In other words, an employer who is following the construction standard for a task that meets the criteria described above ([Sections IX.A. 6a, b, and c](#)) must continue to follow the standard for general industry and maritime for other tasks covered under the standard unless the other tasks also meet the criteria.

**Note 2:** If the employer fails to comply with an applicable provision, including meeting the criteria described in above [Sections IX.A. 6a, b, and c](#), the exemption *does not apply*. If an employer claims this exception, CSHOs should evaluate the standard's three key conditions as stated in this section ([Section IX.A.6](#)). If the employer fails to meet any of these conditions, the CSHO should refer to the general industry/maritime standard (29 CFR § 1910.1053) and cite the employer for any violations of that standard.

7. The standard for general industry and maritime does not apply where the employer has objective data demonstrating that employee exposures to respirable crystalline silica will remain below 25 µg/m<sup>3</sup> as an 8-hour time-weighted average (TWA) under any foreseeable conditions (*see [GIFAQ #1](#)*).

**Note 1:** The exception related to employee exposure levels is based on *total* respirable crystalline silica exposures *from all sources* and must take into account all conditions that may add or contribute to the employee's overall exposure level.

- a. Where an employer claims exclusion from the standard on the basis of objective data, the data must meet the following criteria:
  - Demonstrate employee exposure to respirable crystalline silica associated with a particular product or material or a specific process, task, or activity on which the objective data were based and
  - Reflect workplace conditions *closely resembling or with a higher exposure potential than* the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.
- The data must demonstrate that employee exposure will remain below 25 µg/m<sup>3</sup> as an 8-hour TWA under *any foreseeable*

*conditions.*

- The data must be sufficient to *accurately characterize* employee exposures to respirable crystalline silica. See Section IX. B.4, for the discussion on objective data, and [Sections IX.D.2](#) and [IX.D.3](#), for inspection and citation guidelines for air sampling and exposure assessments.

**Note 2:** For more information on the definition of *objective data*, see 29 CFR § 1910.1053(b) and [Section IX. B.4](#).

- b. The term "*closely resembling*" refers to circumstances where the major workplace conditions (e.g., processes, materials, control methods, work practices, and environmental conditions) which have contributed to the levels of historical exposure are no more protective than in the current workplace. OSHA's intent is to allow data reflecting past exposures to be used to predict current exposures only when the conditions of the earlier job were not more protective (e.g., it would not be acceptable to use data obtained from a task performed outdoors to assess exposures when the task is performed indoors).
- c. The phrase "*any foreseeable conditions*" means situations that can reasonably be anticipated. Because OSHA considers the potential failure of most controls to be a foreseeable condition, the exception applies only where exposures below 25 µg/m<sup>3</sup> as an 8-hour TWA are expected or achieved without the use of controls.
- For example, if an employer controls employee silica exposures using an engineering control such as local exhaust ventilation or a conveyor containment system, the potential failure of those controls is a foreseeable condition, and the employer will not be exempt from the standard on the basis of data showing that exposures are below 25 µg/m<sup>3</sup> as an 8-hour TWA when the ventilation or containment system is used.
  - Employers need not account for the potential failure of some types of controls (e.g., substitution of non-silica-containing materials for materials that contain silica, fixed walls that are a permanent part of a building's structure) when it is not a foreseeable condition when determining whether employee exposure to silica will remain below 25 µg/m<sup>3</sup> calculated as an 8-hour TWA under any foreseeable conditions.
  - Employers need not account for the potential failure of

measures that may contribute, in a limited fashion, to reducing silica exposures, but that are not adopted for that specific purpose (i.e., general building ventilation or heating, ventilation, and air conditioning (HVAC) systems).

8. The construction standard does not apply where employee exposure will remain below  $25 \mu\text{g}/\text{m}^3$  as an 8-hour TWA under *any foreseeable conditions* (including the malfunction or failure of engineering controls implemented to reduce exposures to respirable crystalline silica).
  - a. In general, OSHA anticipates employee exposure would be  $25 \mu\text{g}/\text{m}^3$  or greater when performing any of the tasks on Table 1, abrasive blasting, and tunnel boring, except under the conditions in (b).
  - b. The following tasks, when performed in isolation from other silica-generating tasks, do not typically generate silica at or above  $25 \mu\text{g}/\text{m}^3$  as an 8-hour TWA under any foreseeable conditions: mixing small amounts of mortar; mixing bagged drywall compound that contains crystalline silica only as a trace contaminant; mixing bagged exterior insulation finishing system base and finish coat; removing concrete formwork; using block or tile splitters; using manual (i.e., non-powered) chisels, shears, and utility knives; and pouring concrete footers, slab foundation, and foundation walls (see [CON FAQ #1](#)).

**Note:** Exposures could exceed  $25 \mu\text{g}/\text{m}^3$  as an 8-hr TWA in situations where employees are working with drywall or sanding joint compound for long periods of time in very dusty conditions. Although exposures to respirable crystalline silica may be low during drywall finishing when trace amounts of crystalline silica content joint compound is used, CSHOs should be aware of the potential for exposures to exceed the PEL for *particulates not otherwise regulated* (PNOR) (see [29 CFR § 1926.55](#)). Sample these operations when appropriate.

- c. In many cases, tasks performed for very short periods of time, in isolation from activities that generate significant exposure to silica, will result in exposures below  $25 \mu\text{g}/\text{m}^3$  as an 8-hour TWA under any foreseeable conditions (see [CON FAQ #2](#)).
    - d. In determining whether short-term tasks will result in exposures below  $25 \mu\text{g}/\text{m}^3$  as an 8-hour TWA under any foreseeable conditions, take into account the following:
      - An individual employee's exposures to respirable crystalline silica

from all sources;

- All conditions that may add or contribute to the employee's overall exposure levels (e.g., enclosed spaces); and,
  - If the employee is engaged in a combination of short-term construction tasks that collectively result in a longer duration of exposure, which could exceed 25 µg/m<sup>3</sup>.
- e. The construction standard *does not* require the employer to have objective data demonstrating that employee exposure to respirable crystalline silica will remain below 25 µg/m<sup>3</sup> as an 8-hour TWA under any foreseeable conditions to support the exception.

B. Definitions.

Terms used in the preamble and regulatory text of the Silica standards:

1. *Action level (AL)* means a concentration of airborne respirable crystalline silica of 25 µg/m<sup>3</sup>, calculated as an 8-hour TWA.

**Note:** Employee exposure at or above the AL under any foreseeable conditions triggers applicability of the construction and general industry/maritime standards. In general industry and maritime employers must assess the exposure of each employee who is or may reasonably be expected to be exposed at or above the AL. Additionally, beginning June 23, 2020, the medical surveillance requirement in the general industry/maritime standard (but not the construction standard) is triggered by employee exposures at or above the AL for 30 or more days per year.

2. *Air monitoring data* refers to any air monitoring conducted by the employer to comply with the requirements of the silica standard, including compliance with the prescribed accuracy and confidence requirements (*see* 29 CFR § 1910.1053(d)(5) and 29 CFR § 1926.1153(d)(2)(v), and [Appendix A](#) of the silica standards) (*see* [GI FAQ #8](#)).
3. *Competent person* means an individual who is capable of identifying existing and foreseeable respirable crystalline silica hazards in the workplace and who has the authority to take prompt corrective measures to eliminate or minimize them. The competent person must have the knowledge and ability necessary to fulfill the responsibilities set forth in Section 1926.1153(g) (e.g., make frequent and regular inspections of job sites, materials, and equipment to implement the written exposure control plan (ECP)). A competent person is not required under the Silica standard for general industry/maritime.

- a. The employer can designate any employee to be a competent

person if the employee has the necessary capabilities (whether acquired through training, education or work experience.)

- b. An employee (including one who participates in silica-generating tasks on a job) could be designated as a competent person if he/she can properly implement the employer's written ECP (i.e., knows the tasks involving silica exposure; the engineering controls, work practices, and respiratory protection needed to limit exposure; procedures used to restrict access, where necessary), and has authority to take prompt corrective measures to implement the ECP.
  - c. Competent person training is performance-based. The employer is responsible for ensuring the competent person has the knowledge and ability to implement the written ECP ([see CON FAQs #6, 37, and 38](#)). The training needed will depend on the types of work done. In some cases, successfully completing training required under the Silica standard and OSHA's Hazard Communication Standard (HCS), 29 CFR § 1910.1200, may be enough (e.g., for small construction companies that perform limited silica-generating tasks). In other cases, additional training may be needed, but that would vary among construction companies. For more information on training requirements for a competent person ([see Section IX G.7 and G.8](#) of this Instruction and 81 FR at 16811).
4. *Objective data* means information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to respirable crystalline silica associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions closely resembling or with a higher exposure potential than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations. *See* [29 CFR § 1910.1053\(b\)](#) and [29 CFR § 1926.1153\(b\)](#).
    - a. Types of data and exposure assessment strategies that may qualify as objective data include (*see* [GI FAQ #8](#) and [CON FAQ #19](#)):
      - Data from industry-wide surveys;
      - Data provided by equipment manufacturers;
      - Data provided by trade or professional associations;
      - Exposure mapping (determining exposures associated with



particular locations based on information obtained from sources that may include personal samples, area samples, and direct-reading instruments), (see [GI FAQ #11](#));

- Calculations based on the composition of a substance;
- Calculations based on the chemical and physical properties of a substance (in those instances where a substance's physical and chemical properties demonstrate employee exposure to silica associated with a particular product or material or a specific process, task, or activity); and
- The employer's historical air monitoring data, including data obtained prior to the effective date of the standard.

**Note:** The silica standards do not limit when objective data can be used to characterize exposure. OSHA notes that the same types of objective data that can be used to assess employee exposures under the performance option may be used to demonstrate that employee exposure to silica will remain below the AL of 25  $\mu\text{g}/\text{m}^3$  calculated as an 8-hour TWA under any foreseeable conditions for purposes of ascertaining coverage under 29 CFR § 1910.1053(a)(2) (see [GI FAQ #8](#)).

To ensure adequate employee protection, the objective data can be used to represent current exposures only when the conditions under which the objective data was gathered were not more protective (i.e., it would not be acceptable to use objective data obtained from a task performed outdoors to assess exposures when the task is performed indoors). Refer to the above definition of objective data to determine whether the employer accurately characterized employee exposure.

An employer using the performance option can use data reflecting conditions that are standard across an industry to assess exposures of employees at individual facilities provided that the requirements in the standard are met (see [GI FAQ #14](#)).

5. *Permissible exposure limit (PEL)* means an airborne concentration of respirable crystalline silica of 50  $\mu\text{g}/\text{m}^3$ , calculated as an 8-hour TWA.
6. *Physician or other licensed healthcare professional (PLHCP)* means an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the particular health care services required by 29 CFR § 1910.1053(i) and 29 CFR § 1926.1153(h).

**Note:** A PLHCP can conduct medical examinations and procedures required under the Silica standards when he or she is licensed, registered, or certified by their respective state law to do so. Licensing and scope of practice definitions may vary from state to state. Questions regarding PLHCPs and their scope of practice may be directed to the Office of Occupational Medicine and Nursing (OOMN) in the National Office.

7. *Regulated area* means an area, demarcated by the employer, where an employee's exposure to airborne concentrations of respirable crystalline silica exceeds, or can reasonably be expected to exceed, the PEL.
8. *Respirable crystalline silica* means quartz, cristobalite, and/or tridymite contained in airborne particles that are determined to be respirable by a sampling device designed to meet the characteristics for respirable-particle-size-selective samplers specified in the International Organization for Standardization (ISO) 7708:1995: Air Quality—Particle Size Fraction Definitions for Health-Related Sampling.
9. *Specialist* means an American Board Certified Specialist in Pulmonary Disease or an American Board Certified Specialist in Occupational Medicine.
10. All other definitions in the standard are for terms previously used by OSHA in other health standards, and the terms are similarly defined and used in the new Silica standards. These terms include “Assistant Secretary,” “Director,” “employee exposure,” and “high-efficiency particulate air (HEPA) filter.”

C. Permissible Exposure Limit (PEL).

1. General Information. 29 CFR § 1910.1053(c) and 29 CFR § 1926.1153(d)(1) establish a PEL of 50 µg/m<sup>3</sup> as an 8-hour TWA. Employers must ensure that no employee is exposed to an airborne concentration of respirable crystalline silica above that PEL.

- An AL of 25 µg/m<sup>3</sup> is also established for both standards (29 CFR § 1910.1053(b) and 29 CFR § 1926.1153(b)).

**Note:** Employers that have fully and properly implemented the engineering controls, work practices, and respiratory protection for each employee performing a task listed in Table 1 of the construction standard (29 CFR § 1926.1153(c)) do not need to comply with the requirements of 29 CFR § 1926.1153(d), including the PEL.

2. Inspection Guidelines.

- a. CSHOs should be prepared to collect personal breathing zone samples on the first day of the inspection, whenever possible. When sampling is conducted, collect personal samples to measure the 8-hour TWA for the silica operations likely to exceed the PEL, in accordance with the OSHA Technical Manual (OTM) ([TED 01-00-015](#)), Section II, Chapter 1, and OSHA sampling method ID-142.
- Ensure that samples are collected in the employee's breathing zone (i.e., in a hemisphere forward of the shoulders within a radius of approximately six to nine inches).
  - Based on the specific situation or conditions observed, use discretion to determine whether to sample for a full shift.
  - If CSHOs determine that full-shift sampling is not necessary, document this in the case file.
  - If an air sampling filter becomes overloaded with dusts or other air contaminants while sampling, the result will not be valid. To avoid this situation where high loading of the filter is likely (such as when sampling abrasive blasting operations or grinding tasks), the exposure monitoring should be conducted using consecutive air samples over shorter sampling periods.
  - When sampling "dusty" operations, such as abrasive blasting operations or grinding tasks, periodically inspect the sampling apparatus. If a sampling pump begins to sound different because of heavy loading of the filter, or if the filter appears fully brown or gray with particulates, then the sampling cassette should be replaced. Such overloading may occur in as short a time as 30 minutes or within a few hours depending on the operation.
  - If the operations/processes are not active during the course of the inspection, as appropriate, CSHOs should request from the employer the next available time the process(es) will resume and return to monitor.

**Note:** Refer to [Appendix B](#) of this Instruction for more detailed instructions for collecting air samples.

- b. Review the employer's written ECP to determine which workplace tasks involve exposure to respirable crystalline silica and the engineering controls and work practices the employer planned to implement to limit employee exposures during each listed task.

- c. Review the employer's exposure records or other data the employer used to assess exposures to determine what exposure levels might be expected before entering the work area:
  - If the employer's air monitoring records indicate overexposures, obtain copies of the employer's exposure data for the case file;
  - Any other related attachments or separate documents, such as laboratory analytical results or chain of custody sample forms, should also be placed into the case file.
  - Collect samples if the employer has not assessed exposure, if the employer's assessment indicates exposures could exceed the PEL, or if the employer's assessment may not be representative (e.g., new or different operations are occurring in the workplace that do not closely resemble the operations represented by the employer's exposure data).
- d. Construction employers that have not fully and properly implemented Table 1 (or are performing a task or using equipment not listed on Table 1) must comply with § 1926.1153(d), and the guidelines in this section should be followed to assess compliance with the PEL.
  - The following guidance applies when employees perform both Table 1 and non-Table 1 tasks:
    - Where the employer is fully and properly implementing the specified controls for Table 1 tasks, the CSHO does not need to collect personal air samples for those tasks.
    - Where the employer is not fully and properly implementing the specified controls for Table 1 tasks, the CSHO should sample one or more employees engaged in those tasks, as necessary.
    - Where the same employee is performing Table 1 tasks and also non-Table 1 tasks but the employer *has not* fully and properly implemented the specified controls, the CSHO should sample if exposures from the combined tasks are likely to exceed the PEL.
    - Where an employee is performing non-Table 1 tasks, the CSHO should collect samples for the non-Table 1 tasks/operations that are likely to result in exposures over the PEL.

**Note:** Some examples of silica-generating tools/tasks not on Table 1 include: reciprocating cutting tools, concrete chain saws, wire saws, abrasive blasting and tunnel boring.

- Where sampling two or more tasks, CSHOs should collect full-shift personal samples and document the amount of time spent in each of the separate tasks/operations.

**Note:** CSHOs should consult with the Salt Lake Technical Center if there is a need for guidance.

- If an overexposure is found and it appears that the employer was using appropriate engineering controls and work practices, then to the extent feasible:
  - CSHOs should evaluate the employer's respiratory protection program. Any deficiencies should be addressed in accordance with Section IX.H ([Respiratory Protection](#)) of this Instruction;
  - Where the CSHO documents an employee exposure exceeding the PEL, but all feasible engineering and work practice controls were instituted and all required appropriate personal protective equipment was provided, a violation of the PEL may *not* be cited. Examples of circumstances where this might be expected include work done in confined spaces or within an abrasive blasting containment area or enclosure. The CSHO's assessment of feasibility must be made on a case-by-case basis.

**Note:** See also OSHA Letter, [Use of feasible engineering/work practice controls for exposure to hexavalent chromium, \(Cr\(VI\)\) for welding in confined spaces; housekeeping and disposal of large/bulky waste materials](#), May 31, 2007.

- If CSHOs must enter a regulated area or other areas where anticipated exposures are above the PEL, they should discuss the need with their Area Director (AD) or supervisor prior to entering a regulated area. The CSHO must wear the personal protective equipment (PPE) and clothing required by the employer or as appropriate for the CSHO's inspection or sampling activity. However, CSHOs must be conservative about time spent in areas where high concentrations exist or are suspected.
- e. When sampling employee exposures, CSHOs should:
- Select a suitable remote location from which to view the operation or frequent the work areas often enough to keep the sampling

under surveillance; and

- Review Sections [XIII - XV](#) of this Instruction for specific policies and precautions to minimize exposures of OSHA personnel.

3. Variability in sampling. There may be differences in exposures that may occur due to workplace conditions such as fluctuations in environmental conditions or air movement. For additional information see the OTM at: [https://www.osha.gov/dts/osta/otm/otm\\_toc.html](https://www.osha.gov/dts/osta/otm/otm_toc.html).

a. If a CSHO obtains a sample showing exposures above the PEL but believes, based on the employer's exposure data, that the results may be due to unpreventable exposure variability, the AD may consider whether to conduct a follow-up inspection in lieu of issuing a citation. The CSHO will compare both sets of exposure data to determine whether the employer's data are representative. The evaluation shall:

- Review the employer's long-term body of data to determine their documented exposure pattern; and,
- Review whether the employer's records were obtained for tasks/operations that are representative of those under OSHA's evaluation.

b. The employer has the burden to demonstrate that the CSHO's samples are not representative of normal exposure levels. To meet its burden, the employer must:

- Provide data consisting of a series of full-shift measurements representative of the exposure of the employee(s) under consideration (e.g., related to specific job activity or tasks);
- Demonstrate that the measurements were taken within the last year; and,
- Show that random fluctuations in the TWA exposures above the PEL occur due to circumstances beyond the control of the employer (e.g., environmental conditions or air movement);

c. After reviewing the employer's sampling/documentation, the CSHO should confer with the AD or Assistant Area Director (AAD) regarding the existence (or not) of a violation and whether it is necessary to re-sample or re-inspect at a later date (*see* [81 FR at 16757](#)).

In general, re-sampling is rarely necessary. The employer is responsible for demonstrating that the CSHO's one-day sample is not representative of normal exposure levels.

- d. If the CSHO is not able to re-inspect/resample (e.g., at a construction site or the operation ceased), then the CSHO and AD should consider the following factors before determining whether a citation should be issued:
  - Whether compliance with the PEL can be achieved (based on air monitoring data and/or objective data) in the task/operation for the majority of time that the work is performed (e.g., exposures above the PEL would be rare occurrences);
  - Whether the employer was appropriately maintaining and/or monitoring feasible engineering controls and ensuring adherence to work practice controls; and,
  - If the employer's previous exposure monitoring records adequately demonstrate the exposure pattern for tasks/operations that are representative of those under OSHA's evaluation.

4. Citation Guidelines. Citations for violations of the PEL should be issued as follows:

- a. For general industry/maritime employers:
  - If samples collected show employee exposure above the PEL of 50  $\mu\text{g}/\text{m}^3$ , cite 29 CFR § 1910.1053(c). For citations involving failures to properly implement engineering and work practice controls and require use of respiratory protection follow citation procedures for combining and grouping violations in [CPL 02-00-164](#). Where appropriate, 29 CFR § 1910.1053(f)(1) should be cited and grouped with 29 CFR § 1910.1053(c) and any applicable subparagraphs of 29 CFR § 1910.1053(g).
  - If samples collected show that employees are exposed to respirable crystalline silica over the PEL of 50  $\mu\text{g}/\text{m}^3$ , but the employer has instituted all feasible engineering and work practice controls and employees are adequately protected by an effective respiratory protection program, then there is no PEL violation.

**Note:** Hydraulic fracturing operations in the oil and gas industry have until June 23, 2021, to implement feasible engineering controls to achieve the PEL. See Appendix G of this Instruction for guidance on hydraulic fracturing inspections.

b. For construction employers:

- Where the employer has fully and properly implemented the engineering controls, work practices, and respiratory protection specified on Table 1, then there is no PEL violation;
- Where the employer has not fully and properly implemented the engineering controls, work practices, and respiratory protection specified on Table 1 and sampling shows exposure over the PEL, the CSHO should cite § 1926.1153(c)(1) and paragraph (d)(1) as grouped violations;
- Where sampling shows an overexposure for tasks not on Table 1 and the employer has *not* instituted all feasible engineering and work practice controls or adequately protected employees by an effective respiratory protection program, then the CSHO should cite the overexposure as a violation of 29 CFR § 1926.1153(d)(1);

Deficiencies in any of the requirements for engineering and work practice controls and respiratory protection (29 CFR § [1910.134](#)) should be cited in accordance with the citation procedures for combining and grouping violations in the current [FOM](#). Where appropriate, 29 CFR § 1926.1153(d)(3) and paragraph (e) should also be grouped with the violation related to the overexposure.

c. For both construction and general industry/maritime employers:

- If the CSHO obtains a sample showing exposures above the PEL but has reason to think, based on the employer's exposure data, that the results may be due to unpreventable exposure variability, then the AD may consider whether to conduct a follow-up inspection in lieu of issuing a citation. For more information about how to proceed in such situations, refer to the variability in sampling guidance in [Section IX. C.3.](#)
- Area Offices (AO) will use OSHA's standard practice of accounting for sampling and analytical error providing a margin of error above the PEL before OSHA issues a citation for violating the PEL.
- A violation is established if the measured exposure exceeds the PEL after applying sampling and analytical error (SAE) corrections and applying a 95 percent limit (refer to SAE instructions in the OTM, [TED 01-00-015](#)). Document silica exposures by ensuring that all available exposure data whether



provided by the employer or obtained during the inspection are copied to the case file.

5. Follow-up Inspections.

- a. To determine whether the employer has eliminated hazards or reduced exposures below the PEL, follow-up inspections are conducted in accordance with the [FOM Chapter 3, VII.K](#) based on available resources. Where exposures could not feasibly be reduced to or below the PEL, engineering controls and work practice controls should still be implemented to reduce exposures to the extent feasible, and workers provided with adequate respiratory protection.
- b. For those employers where follow-ups cannot be performed (e.g., certain construction sites or temporary abrasive blasting operations), the AO should ask the employer to provide written updates to document the progress of the abatement efforts, in accordance with [29 CFR § 1903.19](#).
- c. A follow-up inspection is not required when the AO has specific knowledge and documentation indicating that the employer is no longer using respirable crystalline silica or there are no workers exposed to respirable crystalline silica.

D. Exposure Assessment.

An exposure assessment is required so that the employer can select the proper control methods to be used and evaluate the effectiveness of those selected methods.

29 CFR § 1910.1053(d)(1) and 29 CFR § 1926.1153(d)(2)(i) require employers to assess the exposure of each employee who is, or may reasonably be expected to be, exposed to respirable crystalline silica at or above the AL using either a performance option or a scheduled monitoring option.

**Note:** In construction, employers that fully and properly implement the engineering controls, work practices, and respiratory protection as specified on Table 1 do not have to assess the exposure of employees engaged in the task, and the following guidance in this section does not apply.

29 CFR § 1910.1053(d)(4) and 29 CFR § 1926.1153(d)(2)(iv) require reassessment whenever there is a change in the production, process, control equipment, personnel, or work practices that may reasonably be expected to result in new or additional exposures at or above the AL, or when the employer has any reason to believe that new or additional exposures at or above the AL may have occurred.

1. Assessment options. Employers have two options for assessing the exposure of employees: a) the performance option (29 CFR § 1910.1053(d)(2) or 29 CFR § 1926.1153(d)(2)(ii)), or b) the scheduled monitoring option (29 CFR § 1910.1053(d)(3) or 29 CFR § 1926.1153(d)(2)(iii)).

**Note:** An employer may use a combination of these two exposure assessment approaches in a single facility as long as the employer ensures that each employee's exposure is adequately assessed. For each individual employee, the employer may choose to use either the performance option or the scheduled monitoring option (see [GI FAQs #6 and #7](#) and [CON FAQs #19 and #20](#)).

- a. Performance Option. This option allows the employer some flexibility to assess the 8-hour TWA exposure of each employee on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize each employee's exposure to respirable crystalline silica. The employer is responsible for ensuring that the data accurately characterizes employee exposure.

**Note 1:** See definition section for further guidance on use of objective data.

Employers choosing the performance option must:

- Assess exposures before work commences and continue to reassess, as warranted (see [GI FAQ #15](#));
- Ensure that employee exposures have been accurately characterized and that the data reflects each shift, each job classification, and each work area; and,
- Comply with the remaining exposure assessment provisions, where applicable (i.e., reassessment of exposures, methods of sample analysis for air monitoring, employee notification of assessment results, and observation of monitoring, per 29 CFR §§ 1910.1053(d)(4)-(7) and 29 CFR § 1926.1153(d)(2)(iv)-(vii), respectively).

In addition:

- Employers may characterize employee exposure within a range to account for variability in exposure (e.g., employee exposure is between the AL and the PEL) and may also use this option to show that exposures exceed the PEL by a certain level (such as less than

10 times the PEL) after using all feasible controls. The employer would then know the minimum assigned protection factor (APF) necessary (in this example, respiratory protection with an APF of at least 10) (*see* [GI FAQ #9](#));

- Historical air monitoring data, including monitoring data obtained prior to the standards' effective dates, may qualify as objective data to characterize employee exposures. However, the employer has to ensure the data reflect workplace conditions (e.g., processes, types of material, control methods, work practices) and environmental conditions closely resembling or with a higher exposure potential than those in the employer's current operations (*see* [GI FAQ #10](#));
- OSHA permits employers to rely on objective data even where exposures reflected in the data may exceed the AL or PEL. This provides employers with flexibility to assess employee exposures to respirable crystalline silica, and to ensure that the data used are accurate in characterizing employee exposures.

**Note 2:** Objective data, such as historical monitoring data, reflecting “worst case” conditions is helpful in characterizing employee exposure.

- An employer could determine that there are no differences between the exposures of two employees in a certain job classification who perform the same task on different shifts. In this case, the employer could characterize the exposure of the second employee based on the characterization of the first employee's exposure.
  - While there is no set schedule for reassessment of exposures under the performance option, employers have an ongoing duty to accurately characterize employee exposure. Under 29 CFR § 1910.1053(d)(4) and 29 CFR § 1926.1153(d)(2)(iv), an employer must reassess exposures 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 AL or when the employer has any reason to believe that new or additional exposures at or above the AL have occurred.
- b. Scheduled Monitoring Option. This option requires that employers perform initial monitoring and follow-up monitoring at specific intervals based on monitoring results. *See* 29 CFR § 1910.1053(d)(3) and 29 CFR § 1926.1153(d)(2)(iii). Monitoring must assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples reflecting

the exposures of employees on each shift and in each job classification and work area.

Employers following the scheduled monitoring option must do the following:

- Conduct initial monitoring as soon as work begins so that they are aware of exposure levels and where control measures are needed; and,
- Where several employees perform the same job tasks on the same shift and in the same work area, employers may sample a representative number of employees. Representative sampling involves monitoring the employee(s) reasonably expected to have the highest exposure to respirable crystalline silica. This exposure is then assigned to the other employees in the group who perform the same tasks on the same shift and in the same work area ([see GI FAQ #17](#)).

Sample results:

- Results may be used to represent several employees who perform similar work with silica exposures of similar duration and magnitude:
  - For example, monitoring results of the respirable crystalline silica exposure of the employee closest to an exposure source may also be attributed to other employees who are similarly exposed.
- If initial monitoring measures exposures below the AL of 25  $\mu\text{g}/\text{m}^3$ , the employer may discontinue monitoring for employees whose results are represented by that monitoring (in accordance with 29 CFR § 1910.1053(d)(3)(ii) and 29 CFR § 1926.1153(d)(2)(iii)(B));
- If the most recent exposure monitoring indicates exposures are at or above the AL, but at or below the PEL, the employer must repeat monitoring every **six months** (in accordance with 29 CFR § 1910.1053(d)(3)(iii) and 29 CFR § 1926.1153(d)(2)(iii)(C));
- If the most recent exposure monitoring indicates exposures are above the PEL, the employer must repeat monitoring every **three months** (in accordance with 29 CFR § 1910.1053(d)(3)(iv) and 29 CFR § 1926.1153(d)(2)(iii)(D)); and,

- Where the most recent (non-initial) monitoring indicates that employee exposures have dropped below the AL, monitoring must be repeated within **six months** until two consecutive measurements, taken seven or more days apart, are below the AL. At that time, the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring, except as otherwise provided in 29 CFR § 1910.1053(d)(4) and 29 CFR § 1926.1153(d)(2)(iv) (in accordance with 29 CFR § 1910.1053(d)(3)(v) and 29 CFR § 1926.1153(d)(2)(iii)(E)).

**Note:** Following the initial monitoring, construction employers can continue to perform scheduled monitoring at the frequency specified in the standard in new work areas, provided that the task and the workplace conditions in new work areas are substantially similar to tasks and conditions at the time of initial monitoring (i.e., they are not reasonably expected to result in exposures above those detected during the most recent monitoring. (29 CFR §1926.1153(d)(2)(iii) and paragraph (d)(2)(iv)) (see [CON FAQ #21](#)).

- c. Switching Between Exposure Assessment Options. An employer may switch from the scheduled monitoring option to the performance option, and may use air monitoring data generated during repeated scheduled monitoring as objective data under the performance option, provided the data are sufficient to accurately characterize employee exposures. This may be useful in certain workplaces (e.g., for silica operations that are intermittent, variable, and of short duration) or in silica operations where conditions do not normally change and periodic monitoring would provide little information and no added protection for employees (e.g., abrasive blasting operations that greatly and consistently exceed the PEL).

## 2. Inspection Guidelines.

- a. CSHOs should review all air monitoring and/or objective data the employer relied on to assess employee exposure to determine whether the employer has accurately characterized the employees' exposures. CSHOs should verify that the employer's assessment was conducted in accordance with either the performance option or the scheduled monitoring option, as outlined above in Sections IX. D.1.a or b ([Exposure Assessment](#)) of this Instruction:
  - If an employer has not conducted an exposure assessment for any employee working in conditions the CSHO believes are reasonably likely to result in exposures at or above the AL, the CSHO should

conduct personal sampling. In the event sampling cannot be conducted, other evidence should be considered in order to establish that an employee's exposure is reasonably expected to be at or above the AL. For example, the CSHO could review the employer's written exposure control plan, data provided by the equipment manufacturer or trade/professional associations, and exposure data for the relevant task from the rulemaking record. The CSHO should also gather evidence regarding all potential silica-generating tasks/sources and duration of employee exposure(s);

- If there is any uncertainty regarding the accuracy of the employer's exposure assessment, the CSHO should conduct personal sampling. Refer to the previous guidance on air sampling under Section IX. C, [Permissible Exposure Limit](#);
  - CSHOs should be aware that for all industries multiple operations/tasks occurring at the same time in the same area may result in higher worker exposures than those found during individual operations/tasks; and,
  - If there is uncertainty about whether an employer's sample times were representative, CSHOs should consider requesting and reviewing the employer's production records to aid in determining whether the employer's monitoring was representative.
- b. CSHOs should interview employees to determine which shifts and tasks have the greatest exposures, and review the time periods for the samples collected to determine whether the sample times were representative of the work hours and also whether samples were collected in the employee's breathing zone.
- c. The 8-hour TWA exposure is generally best measured by collecting at least one 8-hour air sample from the representative employee, or by collecting two consecutive 4-hour samples. However, the employer (or CSHO) may encounter some situations in which it might be more effective to collect a short-term sample during each task, such as where multiple and different silica exposure tasks are performed throughout the work shift, or the work shift is longer than 8 hours.
- Although it is preferable to sample between 7 and 8 hours of exposure, if an employee's silica exposure is known to be limited to a portion of the 8-hour work shift, exposure may be determined by sampling only during the exposure period and documenting that there was no additional silica exposure during the remainder

of the employee's work shift. [See OTM Section II: Chapter 1- Personal Sampling for Air Contaminants guidance.](#)

**Note:** If an employer appears to have switched sampling options from scheduled monitoring to performance, CSHOs should evaluate the employer's equipment and work practices to ensure they reflect the operations upon which the assessment was based ([see GI FAQ # 7](#)).

### 3. Citation Guidelines.

The following citation guidelines apply whenever employee exposure is reasonably expected to exceed the AL (Inspection Guidelines above has more information on determining reasonably expected exposure levels).

- a. For construction employers with employees engaged in a task identified on Table 1, a citation should not be issued for failure to assess when the employer has fully and properly implemented the specified engineering controls, work practices, and respiratory protection on Table 1 ([see Section IX.E.1.a.](#)).
  - If a construction employer has not fully and properly implemented the specified engineering controls, work practices, and respiratory protection on Table 1 and has not conducted an exposure assessment, the employer should be cited for a grouped violation of 29 CFR § 1926.1153(c)(1) and paragraph (d)(2). Any other noted deficiencies should be separately cited (e.g., hazard communication).
- b. For general industry/maritime employers or for construction tasks not listed in Table 1:
  - If the employer has not conducted an exposure assessment, the employer should be cited for a violation of 29 CFR § 1910.1053(d)(1) or 29 CFR § 1926.1153(d)(2)(i), as appropriate.
  - If the CSHO determines that the employer's assessment of an employee's full-shift exposure is inadequate because of insufficient sampling time and/or insufficient documentation, then cite 29 CFR § 1910.1053(d)(1) (grouped with 29 CFR § 1910.1053(d)(2) or paragraph (d)(3), as appropriate) in general industry or 29 CFR § 1926.1153(d)(2)(i) (grouped with 29 CFR § 1926.1153(d)(2)(ii) or paragraph (d)(2)(iii), as appropriate) in construction.
  - If the employer is using the performance option and the CSHO determines that significant differences exist between the air

monitoring and/or objective data and current conditions which could cause the employee exposure to be underestimated or the employer's assessment was inadequate because the employer failed to assess exposures on all shifts for each job in each work area (e.g., the data do not meet the criteria discussed above), then cite 29 CFR § 1910.1053(d)(2) or 29 CFR § 1926.1153(d)(2)(ii), as well as any other applicable paragraphs.

- If the employer is using the scheduled monitoring option, but samples are inappropriately-applied area (environmental) samples or other non-personal results, or if the employer's personal air samples are not representative of employees on each shift, each job, and in each work area, then cite 29 CFR § 1910.1053(d)(3)(i) or 29 CFR § 1926.1153(d)(2)(iii)(A), as appropriate. In making this determination, evaluate whether:
  - The samples are area (environmental) samples and do not represent personal exposures;
  - The employer's personal air samples do not cover the entire exposure period or all tasks; or
  - The employer is using representative sampling, but the employer's personal air samples are not representative, or the employer failed to sample the employee(s) who were expected to have the highest exposure to respirable crystalline silica.
- If the employer is using the scheduled monitoring option and the employer failed to repeat required monitoring within the specified timeframe, then cite 29 CFR § 1910.1053(d)(3)(iii)-(v) or 29 CFR § 1926.1153(d)(2)(iii)(C)-(E) as applicable.

5. Reassessment of exposures. 29 CFR § 1910.1053(d)(4) and 29 CFR § 1926.1153(d)(2)(iv) require employers to reassess exposures as follows:

When a change in production, process, control equipment, personnel or work practices may reasonably be expected to result in new or additional exposures at or above the AL.

- Whenever an employee performs a different operation and/or moves to a different work location that may result in new or additional exposures at/or above the AL unless the original determination considered these operations;
- Reassessment is not required when the same task is moved from an indoor to an outdoor location, or when a product is replaced with



another product that has lower crystalline silica content in the same process.

6. Inspection Guidelines.

- a. When the employer's exposure assessment does not reflect the exposures being observed, ask the employer and employees about any changes in the production, process, control equipment, personnel, or work practices that could affect respirable crystalline silica exposures. If operations changed, review documentation of the employer's assessment of the new exposure scenario(s).
- b. CSHOs should conduct sampling as necessary to determine whether employers have accurately characterized the exposure of each employee to respirable crystalline silica, and to document exposures the employer failed to assess. Refer to the previous guidance on air sampling under Section IX.C, [Permissible Exposure Limit](#).

7. Citation Guidelines.

If the employer failed to reassess exposures when there was a change in the production, process, control equipment, personnel, or work practices that may reasonably be expected to result in new or additional exposures at or above the AL, or the employer had reason to believe new or additional exposures at or above the AL occurred, CSHOs should cite 29 CFR § 1910.1053(d)(4) or 29 CFR §1926.1153(d)(2)(iv), as appropriate.

8. Methods of sample analysis. 29 CFR § 1910.1053(d)(5) and 29 CFR § 1926.1153(d)(2)(v) require that all air monitoring samples taken to satisfy the monitoring requirements of paragraph (d) must be evaluated by a laboratory that analyzes air samples for respirable crystalline silica in accordance with the procedures in [Appendix A](#) of the silica standards.

- a. The employer must ensure that the laboratory is accredited and follows the specifications outlined in Appendix A to the silica standards. The employer must include the identity of the laboratory on its air monitoring data.

**Note:** Refer to the silica standards' [Appendix A](#) for more requirements. Also, the AIHA Laboratory Accreditation Programs maintains a website where the public can check on the accreditation status of labs at: <http://www.aihaaccreditedlabs.org/AccreditedLabs/Pages/default.aspx>.

9. Inspection Guidelines.

Refer to the previous guidance on sampling under [Section IX.C](#), *Permissible Exposure Limit* and [Appendix B](#) of this Instruction for detailed instructions for collecting air samples. The silica standards allow employers to use any sampling device that conforms to the International Organization for Standardization (ISO) and the European Committee for Standardization (CEN) convention. OSHA uses the Dorr-Oliver cyclone with a flow rate of 1.7 L/min.

10. Citation Guidelines.

If the employer fails to follow the requirements for sample analysis in [Appendix A](#) of the silica standards, CSHOs should cite the employer under 29 CFR § 1910.1053(d)(5) or 29 CFR §1926.1153(d)(2)(v), accordingly.

11. Employee notification. 29 CFR § 1910.1053(d)(6) and 29 CFR § 1926.1153(d)(2)(vi) require employee notification of assessment results. If the employer assesses exposure in accordance with the performance option, the period for notification begins when the employer completes the assessment. The exposure assessment under the performance option is considered completed when the employer has characterized an employee's 8-hour TWA exposure to respirable silica based on air monitoring data, objective data, or a combination of the two.

If the employer assesses exposure in accordance with the scheduled monitoring option, the period for notification begins when the employer receives the monitoring results. This is the case whether the employer conducts the exposure assessment internally or uses a third party to perform the exposure assessment. The standard does **not** provide extra time for notification in cases when it takes longer than the time permitted under the standard for the employer to analyze the sampling results or put them into a report.

General Industry and Maritime.

- a. 29 CFR § 1910.1053(d)(6)(i) requires employers to notify each affected employee individually, in writing, of the results of the exposure assessment within **15 working days** after completing an exposure assessment in accordance with paragraph (d) of the standard. The employer has the option to post the results in an

appropriate location accessible to all affected employees (instead of notifying each affected employee individually) (see [GI FAQ #23](#)).

- b. 29 CFR § 1910.1053(d)(6)(ii) requires that whenever an exposure assessment indicates that employee exposure is above the PEL, the employer must further describe in the written notification the corrective action being taken to reduce employee exposure to or below the PEL.

Construction.

- c. 29 CFR § 1926.1153(d)(2)(vi)(A) requires construction employers to notify each affected employee in writing of the results of an assessment, or post the results in an appropriate location accessible to all affected employees within **five working days** after completing an exposure assessment.
- d. 29 CFR § 1926.1153(d)(2)(vi)(B) requires that when an exposure assessment indicates employee exposure above the PEL, the employer's written notification must further describe the corrective action being taken to reduce employee exposure to or below the PEL.

**Note:** The term “affected” means all employees whose exposures were assessed, including employees whose exposures were determined by representative sampling and employees whose exposures were determined by objective data.

12. Inspection Guidelines.

The CSHO should ask employees whether and when they were given copies of the results of their exposure assessment, or when and where the results were posted.

13. Citation Guidelines.

If employees have not been notified of their exposure assessment results within timeframes specified above, CSHOs should cite 29 CFR § 1910.1053(d)(6)(i) or 29 CFR § 1926.1153(d)(2)(vi)(A) for the relevant industry. If the employer's written notification did not explain corrective action being taken for exposures exceeding the PEL, then cite 29 CFR § 1910.1053(d)(6)(ii) or 29 CFR § 1926.1153(d)(2)(vi)(B) for the relevant industry.

14. Observation of monitoring. 29 CFR § 1910.1053(d)(7) and 29 CFR § 1926.1153(d)(2)(vii) provide affected employees or their designated representatives with an opportunity to observe air monitoring conducted to assess silica exposures.

- a. Employers are required to provide the employee or the employee's designee with protective clothing and equipment at no cost, when observation of monitoring requires entry into an area where the use of protective clothing or equipment is required for any workplace hazard. The employer must ensure that observers, including observers not employed by the employer, use such clothing and equipment.

15. Inspection Guidelines.

- a. Ask affected employees or their designated representative if they were given the opportunity to observe any monitoring of employee exposure and whether they were provided with the appropriate protective clothing and equipment.
- b. Ask affected employees or their representative if the protective clothing and equipment were worn.

16. Citation Guidelines:

- a. If affected employees or their representatives were not provided the opportunity to observe monitoring, or were not provided with the appropriate protective clothing or equipment at no cost during observation, CSHOs should cite 29 CFR § 1910.1053(d)(7)(i) and/or paragraph (d)(7)(ii) or 29 CFR § 1926.1153(d)(2)(vii)(A) and/or paragraph (d)(2)(vii)(B), as appropriate.
- b. If the employer did not ensure affected employees and/or their representative observing monitoring used the provided protective clothing and equipment, CSHOs should cite § 1910.1053(d)(7)(ii) or § 1926.1153(d)(2)(vii)(B).

E. Table 1- Specified exposure control methods (29 CFR § 1926.1153).

- 1. The construction standard requires employers to control their employees' exposure to respirable crystalline silica. The standard provides employers with two options for achieving compliance. The first option is to use the *Specified exposure control methods* approach in 29 CFR § 1926.1153(c). For each employee engaged in a task identified on Table 1, paragraph (c)(1) requires employers to fully and properly implement the engineering controls, work practices, and respiratory protection set forth for the relevant task on Table 1. Table 1 includes some common construction tasks and equipment that are known to generate high exposures to respirable crystalline silica.

The second option is to follow 29 CFR § 1926.1153(d), *Alternative exposure control methods*. For tasks not listed on Table 1, or where the employer does not fully and properly implement the engineering controls, work practices, and respiratory protection described on Table 1, the employer must comply with 29 CFR § 1926.1153(d).

- a. *Employees Engaged in a Table 1 Task.* The phrase “employees engaged in Table 1 tasks” includes employees involved in the Table 1 task, even if they are not operating the equipment listed on Table 1 (e.g., laborers and other employees, including supervisors, who are assisting with the task or have some responsibility for the completion of the task). When respiratory protection is required for a task, all employees engaged in that task must be provided with the required protection.
    - For example, where an employee is assisting another employee operating a walk-behind saw indoors by guiding the saw, both the saw operator and the helper who is assisting the operator are considered engaged in the task and would need to wear a respirator.
    - Similarly, employees assisting a worker jackhammering outdoors (e.g., a crew member using a water hose to spray and wet the concrete) would be considered to be engaged in the task and would also be required to wear a respirator for work lasting more than four hours.
    - An employee directing traffic around another employee jackhammering would not be considered engaged in the task, and, therefore, would not be covered by Table 1.
  - b. *Fully and properly implementing the specified exposure control methods.* The presence of the specified controls is not sufficient to constitute “fully and properly” implementing these controls. In order to be in compliance with paragraph (c)(1), employers must ensure that the controls are present, implemented and maintained, and that employees understand the proper use of these controls and use them accordingly.
2. Specified Engineering and Work Practice Controls. The controls on Table 1 involve use of ventilation, wet methods, enclosed cabs, and, for some tasks, respiratory protection in addition to engineering and work practice controls. The following criteria apply to particular types of engineering controls and work practices or specific pieces of equipment listed on Table 1:

- a. *Dust Collection Systems.* Some entries on Table 1 specify the use of a tool that is equipped with or uses a dust collection system. For example, one of the required engineering controls in paragraph (c)(1)(xi) for employees using a handheld grinder for mortar removal (i.e., tuckpointing) is using a grinder equipped with a commercially available shroud and dust collection system.

A dust collection system typically consists of an industrial vacuum with an exhaust filter, a hose that connects the vacuum to the tool, and a shroud or cowl or, in the case of milling machines and vehicle-mounted drilling rigs, an enclosure that contains the source of the dust. Full and proper implementation of a dust collection system typically includes the following:

- The shroud or cowl must be properly sized, intact, and installed in accordance with the manufacturer's instructions;
- The hose connecting the tool to the vacuum must be intact and without kinks or tight bends that reduce the suction. Employers must use the hose lengths specified by the manufacturer (extension hoses or the addition of multiple inlets will reduce the air flow);
- The filter(s) on the vacuum must be cleaned or changed in accordance with the manufacturer's instructions to prevent overflowing or clogging, which reduces suction and would prevent the vacuum system from operating effectively;
- The filters and dust should be handled so as to minimize worker exposures to silica dust. This could involve disposing of filters and dust in sealed containers, such as heavy-duty plastic bags, to prevent the release of dust into the air;
- The vacuum system must provide the air flow specified on Table 1, or where no air flow is specified, the air flow recommended by the equipment manufacturer;
- The vacuum system must have a filter with a 99 percent or greater efficiency;
- For most entries, Table 1 requires the vacuum system to have a filter-cleaning mechanism; in some cases (e.g., paragraph (c)(1)(xi) handheld grinders for mortar removal and paragraph (c)(1)(xii) handheld grinders for uses other than mortar removal), a cyclonic pre-separator can be used as an alternative to a filter-cleaning mechanism. If so equipped, it may be necessary to activate a back-pulse filter cleaning mechanism several times during the course of

a shift; and,

- The dust collection bags/container must be emptied regularly to avoid overfilling, which would prevent the vacuum system from operating effectively.

**Note:** Several of the entries on Table 1 specify that the dust collection system must be commercially available. This ensures that employers use equipment that is appropriately designed for the tool being used and that will be effective in capturing dust generated from using the tool. Products that are custom-made by aftermarket manufacturers and that are intended to fit the make and model of the tool are considered commercially available. This requirement is intended to exclude do-it-yourself on-site attempts at dust control using substandard or otherwise inappropriate control equipment. Employers who use controls other than those specified on Table 1 must comply with 29 CFR § 1926.1153(d).

b. *Wet methods:* Most of the eighteen entries on Table 1 specify the use of wet methods to control exposures:

- For example, paragraph (c)(1)(xiv), small drivable milling machines (less than half-lane), specifies the use of a machine equipped with supplemental water sprays designed to suppress dust;
- Some of the entries on Table 1 that specify the use of wet methods require that the delivery system must be "integrated" into the tool. For example, paragraph (c)(1)(i), stationary masonry saws, requires the use of a saw equipped with an integrated water delivery system that continuously feeds water to the blade. An integrated water delivery system is one developed by the manufacturer in conjunction with the tool. Integrated systems are able to control dust emissions more effectively by applying water at the appropriate dust emission points (e.g., where the blade meets the work piece) based on tool configuration;
- Where Table 1 requires an integrated control system, employers that use a non-integrated system (e.g., a worker spraying water from a hose on material that another worker is cutting with a stationary masonry saw) have not fully and properly implemented the controls specified on Table 1 and must comply with all the requirements of 29 CFR § 1926.1153(d);
- Where wet methods are implemented for dust control, full and proper implementation of controls under Table 1 involves ensuring the following:

- The availability of a sufficient supply of water on-site to suppress the dust. Where connection to a water main or outlet is not available, water must be provided using portable tanks or water trucks;
- A steady spray of water is directed at the point of dust generation at the flow rate sufficient to minimize release of visible dust; and
- A reliable water delivery system, which would include frequent checking for clogging of the spray nozzles.

**Note:** The possibility for freezing may occur during water application in some regions. Employers should consider using heated water or shelters, or adding environmentally-friendly anti-freeze to the water where work is performed in sub-freezing temperatures. Precautions must be taken to ensure that use of water in freezing temperatures does not create a slip hazard.

- c. *Enclosed cabs:* Four of the entries on Table 1 specify the use of an enclosed cab or booth. For example, 29 CFR § 1926.1153(c)(1)(xvii), heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming or rock ripping) or used during demolition activities involving silica-containing materials, specifies that the equipment must be operated from within an enclosed cab. As described below, 29 CFR § 1926.1153(c)(2)(iii) contains further requirements for an enclosed cab or booth.

**Note:** In this context, abrade means scraping or wearing away silica-containing materials through friction.

- 3. Manufacturer's instructions. Most of the entries on Table 1 require that the equipment must be operated and maintained in accordance with manufacturer's instructions to minimize dust emissions. This means that employers must follow manufacturer instructions that are related to dust control. In determining which instructions might relate to dust control, employers should consider whether the failure to follow the particular instruction would increase employee exposure to silica. Examples of manufacturer instructions for minimizing dust emissions, as listed in [CON FAQ #9](#), could include:

- a. Instructions on the use of water, water supply, and flow rates, including installation and maintenance of integrated water delivery systems.



- b. Instructions on when to change water, where water supply is reused.
- c. Instructions on the use, installation, and maintenance of dust collectors or vacuums, including recommended flow rate (cubic feet per minute (CFM)), HEPA filters, and capacity.
- d. Instructions on the maintenance and replacement of blades.
- e. Instructions on the rotation (*e.g.*, speed, direction) of blades.

Examples of manufacturer instructions that are *not* generally related to minimizing dust emissions include:

- a. Warnings related to electrical, guarding, and noise hazards.
- b. Instructions regarding the use of personal protective equipment (including respiratory protection).
- c. Instructions on fueling and refueling.
- d. Instructions on transporting the tool from worksite to worksite.

Where a given instruction is reasonably related to the level of dust generated, the standard requires employers to follow that instruction, regardless of whether that instruction serves more than one purpose. OSHA recognizes that sometimes manufacturers adopt particular instructions to serve multiple purposes, and the manufacturers' instructions that do not relate to minimizing dust emissions may still be relevant to compliance with other OSHA standards and the OSH Act (*see* [CON FAQ #9](#)).

4. Heavy equipment and utility vehicles. Under 29 CFR § 1926.1153(c)(1)(xvii), engineering controls and work practices must be used when heavy equipment or utility vehicles are used to abrade or fracture silica-containing materials (*e.g.*, hoe-ramming, rock-ripping) or used during demolition activities involving silica-containing materials. Employees engaged in this task operate a variety of wheeled or tracked vehicles ranging in size from large heavy construction equipment, such as bulldozers, scrapers, loaders, cranes and road graders, to smaller and medium sized utility vehicles, such as tractors, bobcats and backhoes, with attached tools that are used to move, fracture, or abrade rock and demolition debris.

Equipment operators typically perform activities such as the demolition of concrete or masonry structures. Some activities vary in amounts of dust generated and thus the level of silica exposure for employees engaged in particular operations could also vary.

- a. When operating heavy equipment and utility vehicles used to *abrade* or *fracture* silica-containing materials or used for demolition activities involving silica-containing materials, Table 1 requires the equipment operator to be in an enclosed cab. Some types of heavy equipment already come equipped with enclosed, filtered cabs that meet the requirements of Table 1. The use of an enclosed cab as the only control is an option if the operator is the only employee engaged in the task. However, if other employees outside the cab are engaged in the task, water and/or dust suppressants must be applied as necessary to minimize dust emissions.
- b. No respiratory protection is required for employees engaged in this task when the requirements of paragraphs (c)(1)(xvii) and (c)(2)(iii) are met:

For example, heavy equipment and utility vehicles used for tasks such as *grading* and *excavating* do not typically generate high levels of dust. Table 1 requires that water and/or dust suppressants must be applied as necessary to minimize dust emissions. (29 CFR § 1926.1153(c)(1)(xviii)). Alternatively, if the equipment operator is the only employee engaged in the task, the operator can operate the equipment from within an enclosed cab (instead of using wet methods and/or dust suppressants). In either case, no respiratory protection is required.

**Note:** The railroad industry also uses heavy equipment to dump and grade silica-containing ballast in track work to support the ties and rails. Such track work is generally subject to OSHA's construction standards including the silica standards for those employees working *outside* the cab, while the employee *inside* the cab is covered by Federal Railroad Administration standards.

5. Respiratory protection. Six of the entries on Table 1 specify the use of respiratory protection in certain specified circumstances and indicate the minimum APF. For a number of these entries, whether respiratory protection is required by Table 1 depends on the task location and the task duration.
  - a. *Task Location.* Some entries (e.g., 29 CFR § 1926.1153(c)(1)(iv), *walk-behind saws*) require respirators when the task is performed indoors or in an enclosed area. This includes any area where,

without the assistance of forced ventilation, the dispersal of airborne dust can be impeded and concentrations can accumulate (*see* [CON FAQ #13](#)).

- For example, a work area with only a roof that does not affect the dispersal of dust would not be considered enclosed; however, an open-top structure with three walls and limited air movement could be considered enclosed. Parking garages, pits, trenches, and swimming pools may qualify as an enclosed area.
- b. *Task Duration.* For some entries on Table 1 (e.g., 29 CFR § 1926.1153(c)(1)(x), *jackhammers and handheld powered chipping tools*) respirator requirements are based on the duration the task is performed, i.e., “less than or equal to four hours/shift” or “greater than four hours/shift.” If respiratory protection is required for either or both of these time periods, the applicable column in the respiratory protection column on Table 1 specifies the minimum APF required.

Before the task is performed, the employer must make a good-faith judgment of the task’s anticipated duration over the work shift, and whether the task is performed continuously or intermittently. The estimate should be based on previous experience and other available information. If the employer anticipates that an employee will be engaged in a task for more than four hours, measured from the beginning of the task, the employer must provide the employee with the required respiratory protection at the beginning of the shift (*see* [CON FAQ #14](#)).

Where tasks are anticipated to last four hours or less, but employees encounter an unforeseen delay that could extend the task duration beyond four hours, the employer must provide the respiratory protection required in the “greater than four hours/shift” column as soon as it becomes evident that the total task duration may exceed four hours.

- If Table 1 indicates that respiratory protection is required whenever the anticipated task duration exceeds four hours, employees engaged in the task must wear the specified respirator during the entire time that the task is conducted (i.e., at the start of the task), not just the period of time that exceeds four hours;
- When determining the silica-related task duration, the duration begins when the tool or equipment is first put into operation and continues until the employee completes the task. This time

includes intermittent breaks in tool usage and clean-up. If, however, there are extended intervals with no silica exposures, the time intervals during which the employee performs tasks not listed on Table 1 need not be included in calculation of the silica-related task duration.

- c. *Calculating Task Duration.* 29 CFR § 1926.1153(c)(3) explains how the task duration factor should be calculated where an employee performs more than one task on Table 1 during the course of a shift. If an employee performed more than one Table 1 task in a shift, the duration of the task (and thus the required respiratory protection) is determined by the combined *total duration of all the Table 1 tasks*.
- Where an employee performs more than one task on Table 1 during the course of a shift, and the total duration of all tasks combined is less than 4 hours, the required respiratory protection (if any) for each task is the protection specified in the 4 hours or less column.
  - If the total duration of all Table 1 tasks combined is more than 4 hours per shift, the required respiratory protection for each task is the protection specified in the more than 4 hours per shift column.

The following examples illustrate this concept:

- *Example 1:* An employee plans to use a handheld grinder (Table 1, (xii)) for 3 hours outdoors to grind/smooth concrete surfaces, and then run a chipping hammer (Table 1, (x)) for 2 hours outdoors, for a total duration of five hours. No respirator is required when grinding outdoors using a grinder equipped with either a water delivery system or a vacuum dust collection system. Table 1 requires the use of a respirator with an APF of 10 when using the chipping hammer for more than 4 hours. Because the combined duration of both tasks is more than 4 hours, a respirator is required the entire time the employee uses the chipping hammer.
- *Example 2:* An employee plans to use a handheld grinder (Table 1, (xii)) indoors for 3 hours with a dust collector to grind/smooth concrete walls, and then uses a chipping hammer (Table 1, (x)) outdoors for 2 hours during the same shift. The combined duration is 5 hours. The employee must use respiratory protection during the entire 5 hours while performing both tasks, not just the period of time that exceeds

4 hours, because both tasks require a respirator for more than 4 hours/shift.

- *Example 3:* An employee plans to use a handheld grinder (Table 1, (xii)) with a dust collector to grind/smooth concrete for 3 hours indoors in the morning, and then for 2 hours for mortar removal (i.e., tuckpointing), (Table 1, (xi)), outdoors in the afternoon. The combined duration is 5 hours. The use of a respirator is required for both tasks because the first task requires a respirator with an APF of 10 for more than 4 hours and the second task requires a respirator with an APF of 25 for task durations greater than 4 hours. In this scenario, the employee must either wear the respirator with an APF of 10 while using the grinder to grind/smooth concrete, and then a respirator with an APF of 25 while using the grinder for mortar removal or tuckpointing, or use a respirator with an APF of 25 for the entire 5 hours.

**Note:** If multiple tasks are estimated to last 4 hours or less, but the tasks will take more than 4 hours total, the employer must immediately re-examine the respiratory protection requirements to determine whether a respirator, or a respirator with a higher assigned protection factor, is needed.

6. Additional Specifications. 29 CFR § 1926.1153(c)(2) contains additional specifications that apply when implementing the control measures specified in Table 1. To fully and properly implement Table 1, employers must follow these specifications, when applicable:
  - a. For tasks performed indoors or in an enclosed area, paragraph (c)(2)(i) requires employers to provide a means of exhaust as needed to minimize the accumulation of visible airborne dust;
    - The means of exhaust could include dilution ventilation through the use of portable fans (e.g., box fans, floor fans, axial fans) to introduce air into the space, portable ventilation systems, or other systems that increase air movement and assist in the removal and dispersion of airborne dust. To be effective, the ventilation must be set up so that movements of employees during work, or the opening of doors and windows, will not negatively affect the airflow (i.e., so that it does not contribute to an employee's exposure).

- b. For tasks performed using wet methods, paragraph (c)(2)(ii) requires employers to apply water at flow rates sufficient to minimize release of visible dust; and
  - Adequate dust capture is dependent on a variety of factors such as dust particle size, blade velocity, spray nozzle size and location, use of surfactants or other binders, and environmental factors (water hardness, humidity, and weather) that must be considered when implementing wet methods.
- c. For measures implemented that include an enclosed cab or booth, paragraph (c)(2)(iii) requires employers to ensure that the cab or booth:
  - Is maintained as free as practicable from settled dust;
  - Has door seals and closing mechanisms that work properly;
  - Has gaskets and seals that are in good condition and work properly;
  - Is under positive pressure maintained through continuous delivery of fresh air;
  - Has intake air through a filter that is 95 percent efficient in the 0.3-10.0  $\mu\text{m}$  range (e.g., Minimum Efficiency Reporting Value or MERV-16 or better); and
  - Has heating and cooling capabilities.

7. Inspection Guidelines for Table 1- Specified Exposure Control Methods.

- a. 29 CFR § 1926.1153(c)(1)-Table 1: The CSHO should determine whether any employees are engaged in a task listed on Table 1 or using the tools or equipment listed on Table 1 on materials containing crystalline silica. If so, the CSHO should consult Table 1 to determine whether the employees are using the engineering controls, work practices, and respiratory protection specified on Table 1 for that particular task or equipment, including following the additional specifications contained in paragraphs (c)(2) and (c)(3).
- b. If the CSHO determines that the employees are *not* using any of the engineering controls, work practices, and/or respiratory protection specified on Table 1 for a particular Table 1 task or equipment, the CSHO should conduct air sampling, as necessary.

**Note:** Table 1 operations requiring respirator use will likely exceed the PEL.

- c. If the CSHO determines that the employees *are* using all of the engineering controls, work practices, and/or respiratory protection specified on Table 1 for that particular task or equipment, then the CSHO should evaluate whether the employer has “fully and properly implemented” the specified control methods. For further guidance, *see* this Instruction’s [Appendix A](#).
- d. To determine if the employer is fully and properly implementing the specified control methods described on Table 1, the CSHO should:
  - Request and review the employer’s written ECP and other relevant programs (e.g., respiratory protection, hazard communication, etc.) and observe the work operation(s);

**Note:** As described in more detail in [Section IX.G.4](#) of this Instruction, an employer’s written ECP must list the specific tasks that involve exposure to respirable crystalline silica, and for each task, a description of engineering controls, work practice controls, and the respiratory protection that will be implemented (*see* [GI FAQs #32 - #34](#), [CON FAQs #30 - #38](#)).

- Interview employees to gather all pertinent information regarding the task, including the materials used and the length of time spent on each task;
- Take photos/videos of tools/equipment and controls and note the make/model of tools or equipment used;
- Where the applicable entry on Table 1 references the manufacturer’s instructions, request and view those instructions;
- Visually observe the level of dust generated during the performance of a Table 1 task. The presence of large amounts of visible dust generally indicates that controls have not been fully and properly implemented. A small amount of dust can be expected even with equipment operating as intended by the manufacturer; however, a noticeable increase in dust generation during the operation of the equipment can be an indication that the dust controls are not operating correctly; and
- Evaluate the employer’s equipment maintenance program and its respiratory protection program.

- e. Construction tasks/operations that are not included on Table 1 and Table 1 tasks where the employers have implemented controls other than those specified on Table 1 are covered under § 1926.1153(d) - *Alternative exposure control methods*. This includes the requirement to conduct an employee exposure assessment.
- f. If the CSHO has questions about whether an employer has fully and properly implemented the controls specified on Table 1 and observes a hazardous condition (e.g., excessive silica dust), air monitoring should be conducted as necessary to determine the level of exposure.
- g. The CSHO should determine the task location through employee interviews and observation (i.e., whether an area is outdoors, indoors, or enclosed).
  - If a task is performed indoors or in an enclosed area the CSHO should:
    - Document the task location by taking pictures of the structure and any presence/accumulation of airborne dust.
    - Ask the employees whether airborne dust builds up while they are performing their tasks.
    - Determine whether employers are providing a means of exhaust (e.g., portable fans or other systems that increase air movement and assist in the removal and dispersion of airborne dust) to minimize accumulation of visible airborne dust, as required by paragraph (c)(2)(i).
- h. If employees are engaged in tasks on Table 1 that require the use of wet methods, the CSHO should request and review the equipment's instructions, observe the equipment in use, and interview employees to determine whether the water is being applied at flow rates (e.g., those recommended by the tool manufacturer) sufficient to minimize release of visible dust, as required by paragraph (c)(2)(ii).
- i. If employees are engaged in a task on Table 1 that requires the use of control measures that include an enclosed cab or booth, the CSHO should request and review the equipment manufacturer's instructions, inspect the equipment, and interview employees to determine whether the equipment complies with paragraphs (c)(2)(iii)(A)-(F).



- j. The CSHO should interview employees, the competent person, and the employer representative(s) to determine: in what task(s) employees are engaged; how long each task is estimated to take; how long the task(s) actually took; whether the employer provided respirators in accordance with Table 1; whether the employees wore respirators while engaged in the task(s) requiring its use; and, if so, what the APF was for the respirators worn.

8. Citation Guidelines for tasks listed on Table 1:

- a. Where a construction employer is performing a task listed on Table 1 and is not following the specified controls, the employer is required to assess and limit exposure in accordance with 29 CFR § 1926.1153(d). If employee sampling shows exposure over the PEL and the employer fails to implement feasible engineering and work practice controls to reduce employee exposure to or below the PEL, the CSHO should cite applicable sections of both 29 CFR § 1926.1153(c) and paragraph (d) and group them.
- Example: If an employee is dry cutting with a stationary masonry saw (i.e., no water is used), no employer exposure assessment was conducted, and sampling shows exposure over the PEL, the CSHO should cite paragraphs (c)(1)(i) and (d)(1), (d)(2)(i), and (d)(3)(i) as a grouped violation.
- b. Where the employer is using but not fully and properly implementing the Table 1 controls and sampling shows overexposure, then cite the appropriate section of 29 CFR § 1926.1153(c) and paragraph (d)(1) as a grouped violation, and any other noted deficiencies (e.g. hazard communication) as separate violations.
- Example: If an employee is using a handheld power saw indoors but not fully and properly implementing the Table 1 controls (e.g., not using the manufacturer's recommended airflow or greater), then cite 29 CFR § 1926.1153(c)(1)(ii) and paragraph (d) as grouped violations.

**Note:** If a construction employer has not fully and properly implemented the specified controls for a Table 1 operation or task, the CSHO should first assess whether the employer is in compliance with 29 CFR § 1926.1153(d), Alternative exposure control methods. Conduct sampling as necessary to determine employee exposure, i.e., whether exposures are at or above the AL or have exceeded the PEL.

- c. CSHOs may encounter multiple silica-generating tasks being performed close to each other. Where it appears that one or more tasks are not fully and properly controlled by following Table 1, CSHOs should sample the uncontrolled task(s). Where results show an overexposure, then cite the employer for the overexposure along with failure to restrict access to work areas (29 CFR § 1926.1153(g)(1)(iv)) and any observed deficiencies related to competent person oversight (29 CFR § 1926.1153(g)(4)) as separate violations.

**Note:** Where the construction employer has not fully or properly implemented the controls on Table 1 or conducted an exposure assessment, but the CSHO has not been able to collect an air sample, consult with the AD before considering citations under 29 CFR § 1926.1153(c) and paragraph (d).

- d. If the CSHO determines that respirator requirements on Table 1 were not fully and properly implemented, the employer falls under paragraph (d), and the CSHO should conduct air sampling, as necessary to determine whether there is an overexposure. Any violation(s) under paragraph (d) shall be grouped with any violations of paragraph (c)(1) and (c)(3), as applicable.

F. Regulated Areas (General Industry/Maritime only).

The term “regulated area” is defined as an area where an employee’s silica exposure exceeds, or can reasonably be expected to exceed, the PEL (see 29 CFR § 1910.1053(b) and [GI FAQs #25](#)).

- 1. Establishing Regulated Areas. 29 CFR § 1910.1053(e)(1) requires the employer to establish a regulated area wherever an employee’s exposure to respirable crystalline silica is, or can reasonably be expected to be, in excess of the PEL.

**Note:** Regulated areas are not included in the construction standard. However, construction employers must comply with 29 CFR § 1926.1153(g)(1)(iv) and ensure that their written ECPs describe procedures for restricting access to silica work areas, when necessary, to minimize the number of employees exposed to respirable crystalline silica and their level of exposure.

- a. Regulated areas limit exposure to as few employees as possible. If an employer has, and adequately enforces, work rules precluding employees from entering a particular area where exposures are

reasonably expected to exceed the PEL, then the employer does not need to treat that location as a regulated area. OSHA notes that if one or more employees will enter the area long enough that it is reasonable to expect their 8-hour TWA exposures to exceed the PEL, the employer must establish a regulated area and *all* employees entering that area must wear respirators (even those not in the area long enough for their exposures to exceed the PEL) ([see GI FAQ #25](#)).

**Note:** Respirable crystalline silica levels in some areas, such as sand towers or traps under the shakeout operations in foundries or areas where employees are performing abrasive blasting, may be so high that any exposure could reasonably be expected to be in excess of the PEL. In such cases, the regulated area requirements in 29 CFR § 1910.1053(e) would apply, regardless of any employer work rules limiting (but not precluding) employee entry.

- b. Paragraph (e)(2) requires employers to demarcate regulated areas from the rest of the workplace in a manner that minimizes the number of employees exposed to respirable crystalline silica within those areas and post signs at all entrances to regulated areas that bear the legend specified in 29 CFR § 1910.1053(j)(2).
- c. Traffic cones, stanchions, tape, barricades, lines, or textured flooring may all be effective means of demarcating the boundaries of regulated areas. In determining how to demarcate regulated areas, employers may consider factors such as the configuration of the area, whether the regulated area is permanent, the airborne respirable crystalline silica concentration, the number of employees in adjacent areas, and the period of time the area is expected to have exposure levels above the PEL ([see GI FAQ #27](#)).
- d. Employers must post signs at all entrances to regulated areas with the prescribed hazard language in 29 CFR § 1910.1053(e)(2)(ii), (j)(2) ([see GI FAQ #27](#)). These signs must include the following language:

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

**Note:** Employers may choose to include additional information on the signs required under the general industry/maritime standard, provided that

the additional information included is not confusing or misleading and does not detract from warnings required by the standard.

- e. Employers must limit regulated area access to employees authorized by the employer and required by work duties to be present in the regulated area, persons observing exposure monitoring, or any person authorized by the Occupational Safety and Health (OSH) Act or regulations issued under it to be in a regulated area, 29 CFR § 1910.1053(e)(3) (*see* [GI FAQ #29](#)).
- f. Employers must provide each employee and the employee's designated representative entering a regulated area with an appropriate respirator, in accordance with 1910.1053(g). Employers must require each employee or designated representative to use the respirator while in the regulated area, regardless of the length of time spent (*see* 29 CFR § 1910.1053(e)(4)).

**Note:** Where the standard requires the use of respiratory protection, employers must institute a respiratory protection program in accordance with 29 CFR § 1910.134 (*see* 29 CFR § 1910.1053(g)(1)).

## 2. Inspection Guidelines.

- a. If the employer has established a regulated area, observe the demarcation area and persons entering and exiting. Determine whether the employer has adequately demarcated a regulated area and whether the demarcation effectively warns employees not to enter unless they are authorized. CSHOs should:
  - Ask employees whether they enter regulated areas and, if so, why; and,
  - Take photographs to document instances where regulated areas are not demarcated and where signs are not posted at entrances.

## 3. Citation Guidelines.

- a. If CSHO air monitoring results indicate that exposures are above the PEL and the employer has not established a regulated area, cite 29 CFR § 1910.1053(e)(1).
- b. If the employer failed to demarcate the regulated area or post the required signage, cite 29 CFR § 1910.1053(e)(2)(i) and/or 29 CFR § 1910.1053(e)(2)(ii), as appropriate.

- c. If non-compliance is related to signage, group the violation with 29 CFR § 1910.1053(j)(2), as appropriate.
  - d. If the employer failed to limit access to the regulated area to those authorized by the standard, cite 29 CFR § 1910.1053(e)(3).
- 4. Respiratory Protection within a regulated area. 29 CFR § 1910.1053(e)(4) requires that employers must provide each employee and the employee's designated representative entering a regulated area with an appropriate respirator in accordance with 29 CFR § 1910.1053(g) and shall require each employee and the designated representative to use the respirator while in the regulated area, regardless of the length of time spent in the regulated area.
- 5. Inspection Guidelines.
  - a. CSHOs should observe employees when they are entering and working inside the regulated areas.
  - b. CSHOs should interview employees, as well as their designated representatives, and document any observed deficiencies.
- 6. Citation Guidelines.

If the employer failed to provide each employee (or the employee's designated representative) entering a regulated area with an appropriate respirator, or failed to require the use of necessary respiratory protection, cite 29 CFR § 1910.1053(e)(4) and group with 29 CFR § 1910.1053(g)(1)(iv).

G. Methods of Compliance.

- 1. Engineering and Work Practice Controls. 29 CFR § 1910.1053(f)(1) and 29 CFR § 1926.1153(d)(3)(i) establish that feasible engineering and work practice control methods shall be used by employers to reduce exposures to and maintain exposures at or below the PEL. In the case of the construction PEL and exposure assessment requirements (*see* Sections [IX.C](#) and [IX.D](#) in this Instruction), these requirements apply for tasks not listed on Table 1, or where the employer does not fully and properly implement the specified control methods in 29 CFR § 1926.1153(c), Table 1. For more information on Table 1, *see* [Section IX.E](#) of this Instruction.
  - a. The silica standards require that employers institute feasible engineering and work practice controls (e.g., administrative controls) as the primary means to reduce and maintain employee

exposures to respirable crystalline silica to levels at or below the PEL.

However, if exposures remain above the PEL but the employer can demonstrate it has implemented all feasible engineering and work practice controls, then the employer is in compliance with 29 CFR § 1910.1053(f)(1) and 29 CFR § 1926.1153(d)(3)(assuming the provision and use of required respiratory protection is in accordance with the standard).

- b. Engineering controls prevent the release of silica-containing dust particles at the source of exposure and include process modification, enclosure or containment, substitution of less toxic materials, worker isolation, general and local ventilation with dust collection systems, and dust suppressants like water.
- c. Work practice controls systematically modify how employees perform an operation, and often relate to the way employees use engineering controls, such as periodic inspection and maintenance of process and control equipment or housekeeping.
- d. If a particular engineering or work practice control not already implemented is feasible, the control shall be considered as an appropriate abatement method if other controls are not successful at reducing exposures to or below the PEL.
- e. The silica standards do not prohibit the rotation of employees (a type of administrative control) to limit employee exposures. However, this practice is discouraged as a means of avoiding implementation of engineering and other work practice controls, due to potential difficulty maintaining employees' exposures at/or below the PEL solely using rotation. Moreover, the use of rotation may require the employer to provide medical surveillance to additional workers and to train many workers on multiple jobs ([see GIFAQ # 30](#)).

**Note:** Hydraulic fracturing operations in the oil and gas industry have until June 23, 2021, to implement feasible engineering controls to achieve the new PEL, 29 CFR § 1910.1053(l)(3)(ii). Until that time, when employee exposures exceed the PEL, employers must provide their employees with appropriate respiratory protection and ensure its use.

- 2. Inspection Guidelines. The CSHO should verify compliance with the engineering control and work practice requirements:
  - a. Observe employees using (or ask the employer to describe and/or

demonstrate) the engineering and work practice controls to ensure that controls are present and appropriate.

- b. If controls are implemented and exposures are still over the PEL and the employer claims that additional engineering or work practice controls are infeasible, it is the employer's burden to prove infeasibility. The CSHO should ask the employer to provide information specific to the particular operation supporting its claim of infeasibility.
- c. To assess whether an employer has reduced exposures to the *lowest feasible level*, evaluate its efforts to control exposures. Examples of evidence employers might offer to show that they have implemented all feasible engineering and work practice controls and reached the lowest feasible level of exposure include:
  - Results of past control efforts;
  - Evidence of previous/current efforts to control dust sources using widely recognized control measures; or
  - Air monitoring results from before and after controls were implemented.
- d. Evaluate employer efforts to prevent or fix malfunctions that would result in increased exposures (e.g., review whether the employer inspects and maintains controls, request preventive maintenance schedules and service records).
- e. Evaluate the implementation of work practice controls, for example:
  - Observe whether tools that use water to control dust spray water at the point of dust generation;
  - Observe positioning of local exhaust hoods.
- f. In construction, for tasks not listed on Table 1 or where the employer has not fully and properly implemented the controls and respiratory protection on Table 1, the employer must comply with the requirements of 29 CFR § 1926.1153(d). The CSHO should conduct personal sampling, when possible, and measure an 8-hour TWA to determine if exposures exceed the PEL and whether the employer has complied with the methods of compliance under 29 CFR § 1926.1153(d)(3).

- g. Where the employees are only performing tasks outlined on Table-1 and the employer is fully and properly implementing the protections described in 29 CFR § 1926.1153(c), 29 CFR § 1926.1153(d) is not applicable. *See* Table 1 flow chart in [Appendix A](#) of this Instruction to determine compliance with § 1926.1153(c) for those following Table 1.

3. Citation Guidelines.

a. General Industry/Maritime.

- If exposures are above the PEL and a general industry/maritime employer has not instituted feasible engineering and work practice controls, or has not maintained the controls that are implemented, cite 29 CFR § 1910.1053(f)(1), grouped with 29 CFR § 1910.1053(c).
- If CSHO air sampling results show that employees are exposed to respirable crystalline silica above the PEL, and the employer has demonstrated that it has implemented all feasible engineering and work practice controls, and employees are adequately protected by an effective respiratory protection program, then no violation of 29 CFR § 1910.1053(f)(1) or paragraph (c) should be cited.

b. Construction.

- Where 29 CFR § 1926.1153(d) applies but the construction employer's engineering and work practice controls are not reducing employee exposures to levels at or below the PEL and the employer cannot demonstrate infeasibility, then cite § 1926.1153(d)(3)(i) and group with § 1926.1153(d)(1).

4. Written Exposure Control Plan. 29 CFR § 1910.1053(f)(2) and 29 CFR § 1926.1153(g) establish requirements for the written ECP. These requirements are applicable to all covered entities (*see* [GI FAQs #32 - #34](#) and [CON FAQs #30 - #38](#)).

- a. All employers covered by the silica standards must establish and implement a written ECP.
- b. Employers may develop a single comprehensive plan for each worksite that includes all of the silica-generating tasks that employees will perform at the worksite (i.e., employers do not need separate exposure control plans for different operations, processes, or shifts conducted at the same worksite).



- c. For construction, employers can develop a single comprehensive plan where employees are performing the same tasks at multiple worksites.
- d. Employers must review and evaluate the effectiveness of the ECP at least annually and update as necessary (29 CFR § 1910.1053(f)(2)(ii) and 29 CFR § 1926.1153(g)(2)) (*see [GI FAQ #34](#)*).
- e. Employers must make the ECP readily available for examination and copying, upon request, to each covered employee, their designated representative, OSHA and the National Institute for Occupational Safety and Health (NIOSH) (29 CFR § 1910.1053(f)(2)(iii) and 29 CFR § 1926.1153(g)(3)).
- f. Written ECPs in both general industry/maritime and construction shall contain at least the following:
  - Descriptions of tasks in the workplace that involve silica exposure as provided by 29 CFR § 1910.1053(f)(2)(i)(A) and 29 CFR § 1926.1153(g)(1)(i);
  - Description of engineering controls, work practices, and respiratory protection used to limit employee exposures for each task, as provided by 29 CFR § 1910.1053(f)(2)(i)(B) and 29 CFR § 1926.1153(g)(1)(ii).
    - These descriptions should include information such as types of controls used (e.g., dust collector with manufacturer's recommended air flow and a filter with 99 percent efficiency), effective work practices (e.g., positioning local exhaust over the exposure source), how items such as filled vacuum bags will be handled, how slurry created when using water to control silica-containing dust will be managed to minimize employee exposure, and, if required, appropriate respiratory protection (e.g., a respirator with an APF of 10) for each task.
    - For construction employers following Table 1, the descriptions must include the additional information necessary to fully and properly comply with Table 1, e.g., information regarding how to implement the controls as described on Table 1 or information on ensuring compliance with 29 CFR § 1926.1153(c)(2)(i)-(iii), as applicable.

For example, where an employee is operating a crushing machine, the description of the control measures in the written

exposure control plan should include information on how to operate and maintain the crushing machine in accordance with manufacturer's instructions to minimize dust emissions (as specified in 29 CFR § 1926.1153(c)(1)(xvi)).

Another example would be where employees are engaged in a task on Table 1 that requires the use of wet methods, the description of the control measures should include instructions about applying water at flow rates sufficient to minimize release of visible dust, e.g., the appropriate flow rate in gallons per minute, as required by 29 CFR § 1926.1153(c)(2)(ii).

- The purpose of this requirement is to ensure that exposures to respirable crystalline silica hazards are consistently controlled.
- Description of housekeeping measures used to limit employee exposures, as provided by 29 CFR § 1910.1053(f)(2)(i)(C) and 29 CFR § 1926.1153(g)(1)(iii). This requirement ensures that employers identify and implement appropriate cleaning methods such as HEPA-filtered vacuums, wet sweeping, and use of sweeping compounds to protect employees from respirable crystalline silica that can become airborne while performing housekeeping activities.

Ensuring safe housekeeping methods helps to consistently control exposures and hazards related to respirable crystalline silica. These housekeeping measures may encompass other types of work practices, for example:

- Maintaining exposed surfaces as free as practicable of silica-contaminated dust;
- Cleaning/emptying dust collection systems and dust disposal; and,
- Refraining from blowing or shaking silica-contaminated clothing to remove the dust that can contribute to employee exposures.
- Under the construction standard, the ECP must include a description of procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to respirable crystalline silica and their level of exposure, including exposure generated by other employers, as provided by 29 CFR § 1926.1153(g)(1)(iv). Restricting access is necessary where respirator use is required under Table 1 or an exposure assessment

reveals that exposures are in excess of the PEL. The competent person may identify additional situations where limiting access is necessary.

- Employees on the work site not engaged in the task (for example, an employee directing traffic near a jackhammering area), but still likely to be exposed to silica dust, must be protected from exposure by procedures for restricting access to any areas with high silica dust concentrations.
  - Acceptable procedures a construction employer can use to restrict access include:
    - Erecting permanent or temporary barriers around silica-generating tasks;
    - Posting signs or other warnings around silica-generating tasks;
    - Scheduling high-exposure tasks when others will not be in the area; or
    - Directing employees to stay away from employees performing silica-generating tasks (*see* 81 FR at 16718, 16803-04). The method(s) selected must be described in the written ECP.
- g. Employers in general/maritime and construction industries could also consider including the following useful information in their ECP as applicable:
- A description of environmental factors such as weather (e.g., wind, humidity) and soil compositions (e.g., clay versus rock), and could also specify the location of the task, (e.g., task is performed in an enclosed space);
  - Signs that indicate when controls are not working effectively, procedures used to verify whether the controls are working effectively, and schedules for conducting maintenance checks;
  - A description of factors that affect exposures, such as types of silica-containing materials handled in those tasks (e.g., concrete, tile).

## 5. Inspection Guidelines.

- a. The CSHO should request and review the employer's written ECP to ensure that it includes each of the required elements.

- b. In construction, observed deficiencies in the plan and evaluation procedures should be discussed with the employer's competent person to determine what previous efforts, if any, may have been made to evaluate how well the employer's plan was working.
- c. The plan must be tailored to cover the specific work tasks and practices in the workplace. The provisions listed in 29 CFR § 1910.1053(f)(2)(i)(A)-(C) and 29 CFR § 1926.1153(g)(1)(i)-(iv) must be included in the written ECP.
- d. The CSHO should interview affected employees, including the competent person (for construction-related tasks), as part of the overall assessment of the employer's ECP.
  - Ask the employees if the ECP is made available to them for review.
  - Ask the employer how often the written ECP is reviewed and evaluated for effectiveness.
  - Ask the employer and employees if there were any revisions to the ECP.
- e. Compliance with the ECP should be verified during the walk-around by personal observation and employee interviews.
- f. Questions asked during the interview should focus on determining how familiar the employee is with the ECP.

6. Citation Guidelines.

- a. If the employer has no written ECP, cite 29 CFR § 1910.1053(f)(2)(i) or 29 CFR § 1926.1153(g)(1) as appropriate.
- b. If deficiencies as outlined in 29 CFR § 1910.1053(f)(2)(i)(A)-(C) and 29 CFR § 1926.1153(g)(1)(i)-(iv) are found in the employer's ECP, cite the appropriate subparagraph(s).
- c. Multiple deficiencies found during the inspection, especially long-term deficiencies, could indicate inadequate evaluation or updating. If the employer failed to review and evaluate the written ECP at least annually, cite 29 CFR § 1910.1053(f)(2)(ii) or 29 CFR § 1926.1153(g)(2) as appropriate.
- d. If the employer failed to make the written ECP readily available to employees, designated representatives, OSHA or NIOSH for

examination and copying, cite 29 CFR § 1910.1053(f)(2)(iii) or 29 CFR § 1926.1153(g)(3) as appropriate.

7. Competent Person (construction standard only). 29 CFR § 1926.1153(g)(4) requires the employer to designate a competent person to make frequent and regular inspections of job sites, materials, and equipment to implement the written ECP. There is no competent person requirement under the general industry/maritime standard; however, those employers are not precluded from having such a person to administer the written ECP.

- a. The competent person must have the knowledge and ability to perform the duties required in 29 CFR § 1926.1153(g)(4) and be familiar with, and capable of ensuring, that controls and other protections specified in the plan are implemented. For more information on the qualifications to be a competent person, see the definition of competent person discussed in [Section IX.B.3](#).
- b. The competent person must make routine observations such as visually evaluating dust generated from tasks being conducted. Where increases in visible dust occur, the competent person's role is to take prompt corrective action.
- c. It is the responsibility of the competent person to make frequent and regular inspections of job sites, materials, and equipment for purposes of implementing the ECP and to identify existing and foreseeable respirable crystalline silica hazards in the workplace. He/she is also responsible for ensuring implementation of the written ECP (i.e., ensuring engineering controls, work practice controls, required respiratory protection, housekeeping measures, and procedures to restrict access are implemented for the silica-generating tasks listed in the plan).

**Note:** The standard does not define frequent and regular inspections or establish a set frequency to conduct worksite inspections. At a minimum, frequent and regular means sufficient to evaluate the effectiveness of the implementation of the written exposure control plan (e.g., to identify silica hazards and verify that effective control measures are being used).

- d. The frequency of inspections necessary to evaluate the implementation of a given plan can vary depending on a host of factors, such as the size of the worksite, the number of employees on the site, the complexity and diversity of the employer's operations, and environmental conditions.

- For example, in cases where the competent person is the only person on a jobsite, frequent inspections of the site would include continuous assessment of variables associated with the job that the competent person is conducting (e.g., signs that the controls are not functioning effectively, a change in weather conditions that might require an adjustment of controls, or moving from an outdoor area to an enclosed area). Employers should remember that site assessment must be an ongoing process because of the changing environmental and work conditions encountered on construction job sites (*see* 81 FR at 16808).
- e. There is no requirement that a competent person be present at a construction jobsite at all times. The competent person can leave the site periodically, so long as he or she fulfills the responsibilities in paragraph (g). The competent person must make sufficient inspections to identify situations that could result in hazardous conditions (e.g., indications of failure of engineering controls), and ensure that corrective measures are taken. Therefore, the conditions at each individual worksite will dictate whether a competent person is needed at the jobsite at all times.
  - f. The competent person must be a person who is qualified and retains the accountability and responsibility for the day-to-day implementation of the written ECP for the site under his/her control.
  - g. The identity of the competent person is not required to be listed in the written ECP. However, employees must be able to identify the competent person, and 29 CFR § 1926.1153(i)(2)(i)(E) requires each employee covered by standard to be trained on the identity of the competent person.

8. Inspection Guidelines.

A competent person is required to implement the written ECP and to ensure that controls are functioning effectively. The extent of training or experience required for the competent person could vary based on the complexity of the hazards in the worksite. CSHOs should conduct interviews to assess whether the competent person(s) has the knowledge to implement the ECP and is familiar with the engineering controls, work practices, respiratory protection, and housekeeping methods for the worksite, and whether they have actually implemented the ECP. The CSHO should:

- Ask the employer and employees the identity of the competent person(s) on a jobsite;

- Ask the employer and employees how often the competent person conducts inspections of the site, materials, equipment and what those inspections involve;
- Ask the identified competent person how often he or she conducts inspections of the site, materials, equipment and what those inspections involve;
- Ask the employer and the competent person about his or her knowledge and ability related to implementing the ECP (based on level of training, education and work experience);
- Ask the competent person about the tasks involving silica exposure and how the employer controls them;
- Ask the competent person how he or she determines that controls are working;
- Ask the competent person how the employer restricts access to high-exposure areas; and
- Ask the competent person about authority to promptly correct or eliminate silica hazards.

9. Citation Guidelines.

An employer's failure to designate a competent person, or an employer's designation of a competent person who is not qualified, or if a competent person fails to conduct frequent and regular inspections of jobsites, materials, and equipment to implement the ECP, cite 29 CFR § 1926.1153(g)(4).

10. Abrasive blasting. 29 CFR § 1910.1053(f)(3) and 29 CFR § 1926.1153(d)(3)(ii) require the employer to comply with other OSHA standards, if applicable, when performing abrasive blasting operations using crystalline silica-containing blasting agents or where abrasive blasting is conducted on substrates that contain crystalline silica. Examples of such OSHA standards include:

- a. Ventilation standards, 29 CFR § 1910.94 and 29 CFR § 1926.57, which require the employer to keep the concentration of respirable dust in the breathing zone of the abrasive-blasting operator below the levels specified in 29 CFR § 1910.1000 or 29 CFR § 1926.55 for operations where abrasive blasting of coated materials may create exposures to hazardous dusts.

- b. Mechanical Paint Removers, 29 CFR § 1915.34, which requires employers to provide eye and respiratory protection to employees working in areas where unsafe concentrations of abrasive materials and dusts are present or as per 29 CFR § 1915 Subpart Z.
- c. Personal Protective Equipment, 29 CFR § 1915 Subpart I, which requires employers to perform a hazards assessment to determine what hazards are present, and provide workers with the appropriate PPE to protect them from the hazard(s) identified.

**Note:** Where an alternative abrasive material not containing silica (e.g., steel shot, glass beads) is used, also evaluate for any hazards associated with the material.

#### 11. Inspection Guidelines.

- a. The CSHO should observe and evaluate an employer's abrasive blasting operation for compliance with applicable OSHA standards. In addition to the inspection guidelines listed throughout this directive, the specific instructions below apply to inspections of abrasive blasting operations where crystalline silica-containing blasting agents are being used, or where abrasive blasting is conducted on substrates that contain crystalline silica.
- b. The air-sampling device, such as a cyclone, needs to be placed within the breathing zone (6-9 inch radius), outside any protective equipment (including the abrasive blasting respirator).
- c. When conducting an inspection, a CSHO should:
  - Conduct monitoring to determine employee exposure to metals, such as lead, arsenic, beryllium, manganese, chromium, cadmium, copper, and magnesium. (Abrasive blasters may be exposed to metals either from the surface being blasted or from non-silica abrasive media). The CSHO should review the safety data sheet for the abrasive blasting media to determine the content;
  - Conduct exposure monitoring of potentially exposed employees not engaged in abrasive blasting but still working close to the blasting operation;
  - Conduct noise exposure monitoring inside the hood, appropriate to evaluate compliance with OSHA's Noise standard, 29 CFR § 1910.95 or 29 CFR § 1926.52;
  - Determine whether the ventilation systems for abrasive blasting



rooms and containment structures prevent escape of dust and provide prompt clearance of dust-laden air;

- Determine whether each blast cleaning nozzle is properly equipped with an operating valve that must be held open manually;
- For supplied-air respirators, evaluate breathing air quality and use. For oil-lubricated compressors, ensure that the compressor is equipped with a high-temperature or carbon monoxide alarm, or both, to ensure that carbon monoxide levels remain below 10 parts per million (ppm). *See 29 CFR [§ 1910.134](#), paragraph (i) – Breathing air quality and use;*

**Note:** Using an abrasive blasting hood while wearing a filtering face piece respirator voids the NIOSH-approval certification for both respirators.

- When compressors are used to supply air, ensure that in-line absorbent beds are used and maintained;
- Review electrical grounding;
- Review pressure controls;
- Determine whether the abrasive blasters have adequate PPE, such as canvas or leather gloves and aprons, to protect against injury from material impact; and
- Where an alternative abrasive material is being used that does not contain crystalline silica, such as glass beads, steel grit and shot, sawdust, and shells, ensure that an appropriate evaluation of the hazards associated with the material has been conducted.

12. Citation Guidelines:

- a. If overexposures to metals or noise are found, then cite the applicable paragraph(s) in the appropriate air contaminant or noise standard.
- b. If the ventilation system for a blast cleaning enclosure is found to be inadequately designed or ineffective at controlling dust, then the applicable section of 29 CFR § 1910.94(a) or 29 CFR § 1926.57 should be cited and grouped with 29 CFR § 1910.1053(f)(3) or 29 CFR § 1926.1153(d)(3)(ii), as well as 29 CFR § 1910.1053(f)(1) or 29 CFR § 1926.1153(d)(3)(i), as applicable.

- c. If blast cleaning nozzles are not properly equipped with operating valves that must be held open manually, then 29 CFR § 1910.244(b) or 29 CFR § 1926.302(b)(10) should be cited.
- d. For violations related to respiratory protection for abrasive blasting operations, cite under 29 CFR § 1910.94(a)(5) and group with the applicable sections of 29 CFR § 1910.134, as well as 29 CFR § 1910.1053(g) or 29 CFR § 1926.1153(e).
- e. For violations related to personal protective equipment (PPE), cite under 29 CFR §§ 1910.94(a)(5), 1910.132, 1915.34, 1926.28, 1926.95, or 29 CFR §§ 1926.100-103, as appropriate, grouped with 29 CFR § 1910.1053(f)(3) or 29 CFR § 1926.1153(d)(3)(ii), as applicable.

#### H. Respiratory Protection.

- 1. 29 CFR § 1910.1053(g) and 29 CFR § 1926.1153(e) establish requirements for respiratory protection.
  - a. Where respiratory protection is required by the Silica standards, 29 CFR § 1910.1053(g)(1) and 29 CFR § 1926.1153(e)(1) require employers to provide employees with appropriate respiratory protection that complies with the requirements of these paragraphs and OSHA's Respiratory Protection standard, 29 CFR § 1910.134.
  - b. Where respirator use is required, 29 CFR § 1910.1053(g)(2) and 29 CFR § 1926.1153(e)(2) require the employer to institute a respiratory protection program in accordance with 29 CFR § 1910.134.
  - c. In general industry and maritime, respiratory protection is required in the following situations:
    - Where exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls;
    - Where exposures exceed the PEL during tasks, such as certain maintenance and repair tasks, for which engineering and work practice controls are not feasible;
    - During tasks for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL; and,

- During periods when the employee or designated representative is in a regulated area.
- d. In construction, respiratory protection is required:
- Where specified by Table 1 and
  - Where exposures exceed the PEL either during tasks not listed on Table 1 or where the employer does not fully and properly implement the engineering controls, work practices, or respiratory protection described on Table 1. Such as:
    - Where exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls;
    - Where exposures exceed the PEL during tasks, such as certain maintenance and repair tasks, for which engineering and work practice controls are not feasible; and
    - During tasks for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL.
2. The respiratory protection standard includes APFs (*see* 29 CFR § 1910.134(d)(3)(i)(A) outlined on *Table 1- Assigned Protection Factors*). The APF table shows the level of respiratory protection that a given respirator or class of respirators is expected to provide when the users are properly fitted and trained, and the employer has implemented a continuing, effective respiratory protection program.
  3. 29 CFR § 1926.1153(e)(1) requires employers to provide each employee the appropriate respirator under § 1910.134. For tasks listed on Table 1, if the employer fully and properly implements the engineering controls, work practices, and respiratory protection specified on Table 1, the employer is considered in compliance with paragraph (e)(1). *See* 29 CFR § 1926.1153(c)(1) and paragraph (c)(3).
  4. Construction employers who perform tasks not listed on Table 1, or do not fully and properly implement the controls described on Table 1, have to comply with the requirements under 29 CFR § 1910.134(d)(1) and paragraph (d)(3) where exposures exceed the PEL.
  5. 29 CFR § 1910.134(e)(6)(i)(A) requires employers to obtain a written recommendation from the PLHCP regarding the employee's ability to use a respirator. If an employee receives medical surveillance under the silica

standard, the PLHCP's written medical opinion for the employer also must include any recommended limitations on the employee's use of respirators. *See* 29 CFR § 1926.1153(h)(6)(i)(C), as well as 29 CFR § 1910.1053(i)(6)(i)(C).

6. If a PLHCP determines through either a medical evaluation under the respiratory protection standard, or medical surveillance under the silica standard, that an employee's health is at increased risk if a negative pressure respirator is used, but the employee can use a powered air purifying respirator (PAPR), then the employer must provide a PAPR (*see* 29 CFR § 1910.134(e)(6)(ii)).
7. Where the silica standards require respiratory protection, OSHA's respiratory protection standard requires the employer to provide a medical evaluation to determine the employee's ability to use a respirator before fit testing and use. *See* 29 CFR § 1926.1153(e)(1), (e)(2); 29 CFR § 1910.1053(g)(1), (g)(2); and 29 CFR § 1910.134(e). Regardless of whether an employee refuses medical surveillance, an employee may perform silica exposure tasks that require respirator use only if they undergo the medical evaluation required by the Respiratory Protection standard and is cleared to wear a respirator.
8. Inspection Guidelines.
  - a. Verify that the employer has established and implemented an appropriate respiratory protection program that contains all the required elements. Review the employer's written program, make observations during a walk-around, and conduct employee interviews.
  - b. Evaluate whether respiratory protection is being used when required. CSHOs should also review the employer's ECP to verify whether it includes a description of the respiratory protection used to limit employee exposure to respirable crystalline silica for each task.
  - c. Evaluate the adequacy of respiratory protection based on an exposure assessment by the employer or the CSHO when exposure exceeds the PEL.
  - d. The APF of the respirator used must be high enough to maintain the employee's exposure to respirable crystalline silica at or below the Maximum Use Concentration (MUC) (e.g., the product of multiplying the APF of the respirator by the PEL for silica) (*see* 29 CFR § 1910.134(d)(3)(i)(B)(1)).
  - e. Review medical evaluation results that are authorized under the

respiratory protection standard (29 CFR § 1910.134(e)) and the PLHCP or specialist's written medical opinion for the employer and conduct interviews to determine whether there are any employees wearing respirators who should not be.

- f. Determine if the requirements of 29 CFR § 1910.134(e) are being met by interviewing a number of employees and asking whether they have been provided with a confidential evaluation of their ability to wear a respirator.
- g. For guidance on inspection procedures for 29 CFR § 1910.134, refer to the [\*Inspection Procedures for the Respiratory Protection Standard\*](#) compliance directive (CPL 02-00-158), June 26, 2014.

9. Citation Guidelines.

29 CFR § 1910.1053(g)(2) and 29 CFR § 1926.1153(e)(2) require employers to comply with the respiratory protection standard when respirators are required by the silica standards.

- a. If the employer does not provide appropriate respiratory protection for employees in the above situations, cite the applicable subparagraphs of 29 CFR § 1910.1053(g)(1) or 29 CFR § 1926.1153(e)(1) and group with the applicable provision of the respiratory protection standard, as appropriate.
  - For example, when a general industry/maritime employer has provided a respirator that does not maintain an employee's exposure to respirable crystalline silica at or below the MUC (or does not provide a respirator at all), 29 CFR § 1910.1053(g)(1) should be cited and grouped with the applicable provisions under 29 CFR § 1910.134(d)(3)(i)(B)(1).

Likewise, if a construction employer commits the same violation, 29 CFR § 1926.1153(e)(1) should be cited and grouped with the applicable provisions under 29 CFR § 1910.134(d)(3)(i)(B)(1).

- b. If a construction employer is not providing respiratory protection as specified on Table 1, but has otherwise implemented the other controls specified on Table 1, CSHOs should cite for non-compliance with 29 CFR § 1926.1153(e) and group with 29 CFR § 1926.1153(c)(1), (d)(1) where there is exposure above the PEL. CSHOs have to show that 29 CFR § 1926.1153(e)(1)(ii) applies to establish a violation of 29 CFR § 1926.1153(e)(1)(ii)(A), (B), and/or (C).

- c. If employees are required to wear respirators, employers are required to have a written respiratory protection program. If the employer has not implemented the program or elements of it are deficient or missing, CSHOs should cite 29 CFR § 1910.1053(g)(2) or 29 CFR § 1926.1153(e)(2), as appropriate, grouped with 29 CFR § 1910.134(c).
  - If program elements are deficient or missing, CSHOs shall group where appropriate and cite the applicable subparagraphs under 29 CFR § 1910.134.
- d. If there is a discrepancy between the written respiratory protection program and work practices implemented for use of respirators at the work site, cite 29 CFR § 1910.1053(g)(2) or 29 CFR § 1926.1153(e)(2) and group with applicable paragraphs under 29 CFR § 1910.134(d)-(m).

**Note:** All employers covered by the standards, including those employers following Table 1, must still comply with all provisions of 29 CFR § 1910.134, as applicable. This means workers wearing respirators must be medically evaluated, fit-tested, and trained, and the employer must ensure proper use and maintenance of the respirators where needed.

#### I. Housekeeping Practices:

- 1. 29 CFR § 1910.1053(h)(1) and 29 CFR § 1926.1153(f)(1) prohibit dry sweeping and dry brushing where such activities could contribute to employee exposures to respirable crystalline silica *unless* wet sweeping, HEPA-filtered vacuuming, or other methods that minimize the likelihood of exposure are not feasible. An employer alleging infeasibility must demonstrate that no alternative method that minimizes the likelihood of exposure is feasible.

**Note:** The term “dry brushing” as used in the Silica standards is intended to restrict dry brushing activity that is comparable to dry sweeping, such as using a brush as a tool to clean clothing or surfaces. The standards do not prohibit employees from using their hands to remove small amounts of visible dust from their clothing.

- a. The limited infeasibility exceptions included in these housekeeping provisions are intended to encompass situations where wet methods, HEPA-filtered vacuuming, and other exposure-minimizing methods are not effective, would cause damage, or would create a hazard in the workplace. *See* 81 FR at 16795-96.
  - An employer can establish infeasibility for these purposes by

demonstrating that wet sweeping, using a HEPA-filtered vacuum, and other methods that minimize the likelihood of exposure would negatively impact the quality of the work being done, would not be effective, would cause damage, or would create a hazard in the workplace. However, even in cases where one of the acceptable cleaning method may not be feasible, employers may be able to use another acceptable cleaning method (*see* [GI FAQ #37](#)).

- For example, wet sweeping may be infeasible where water comes into contact with molten metal and creates an explosion hazard. However, an employer that could not wet sweep may be able to use another acceptable cleaning method, e.g., HEPA-filtered vacuuming. In order to dry sweep or dry brush, the employer would need to show that no alternative methods are feasible.
- b. The proper use of commercially-available dust-suppression sweeping compounds (e.g., oil or wax based) in accordance with the manufacturer’s instructions is a cleaning method that minimizes the likelihood of exposure for purposes of 29 CFR § 1926.1153(f)(1) and 29 CFR § 1910.1053(h)(1), and therefore, is an acceptable dust suppression housekeeping cleaning method under the standard (*see* [GI FAQ #38](#), [CON FAQs #26 and #27](#)).
- c. Some commercially-available dust-suppression sweeping compounds contain quartz silica. If an employer use such compounds, the CSHO should review the compound’s safety data sheet (SDS) and evaluate the dry sweeping operations. If the CSHO determines that the compound was used properly and it effectively suppresses the generation of respirable dust during dry sweeping or dry brushing, (i.e., the sweeping activity does not appear to contribute to airborne dust exposure), then the use of the silica-containing sweeping compound would not be subject to the housekeeping restrictions in the silica standard (*see* [GI FAQs #38 and #39](#) and [CON FAQs #26 and #27](#)).
- d. Some general industry employers (e.g., foundries) use drivable powered industrial sweepers to clean dust. These sweepers are equipped with rotating brushes that lift dust from the floor and feed the dust into a vacuum located on the underside of the equipment. When these types of sweepers are equipped with HEPA filters and effectively remove the dust, their use is considered “HEPA-filtered vacuuming” for purposes of 29 CFR § 1910.1053(h)(1) of the standard. When these sweepers are not equipped with HEPA filters, their use is considered an “other” acceptable housekeeping method when they are operated and maintained properly so as to minimize the likelihood of

employee exposure. CSHOs should evaluate the employer's ECP to ensure that the employer has assessed exposures related to use of these sweepers (see [GI FAQ #36](#)).

**Note 1:** For *all* such drivable powered industrial sweepers (HEPA or non-HEPA), the employer using these type of sweepers must ensure compliance with *all* applicable provisions of the silica standard, including reducing exposures to or below the PEL.

**Note 2:** Notwithstanding vacuums on the sweepers described above, the use of a non-HEPA filtered vacuum for housekeeping would *not* be considered an “other [housekeeping] method” because it does not minimize the likelihood of exposure. OSHA discourages cleaning with non-HEPA-filtered vacuums because respirable particles discharged through the vacuum's exhaust into the immediate work area could contribute to employees' silica exposures. If fugitive dust from non-HEPA-filtered vacuuming or other discharge from vacuums contributes to employee exposures that exceed the PEL, the employer would need to follow the hierarchy of controls to reduce and maintain exposures to or below the PEL in accordance 29 CFR § 1910.1053(f)(1) and 29 CFR § 1926.1153(d)(3). Typically, an employer's use of such non-HEPA-filtered vacuums would necessitate employee exposure assessment.

When a housekeeping method is reasonably expected to result in exposures at or above the AL, the employer must comply with exposure assessment requirements and other applicable provisions of the standard.

- e. Employers must ensure that vacuum system filters and dust are handled so as to minimize worker exposures to silica dust. This could involve disposing of filters and dust in sealed containers, such as heavy-duty plastic bags, to prevent the release of dust. Employers must also ensure that filter cleaning and dust disposal are covered in their written exposure control plans, when required by 29 CFR § 1910.1053(f)(2)(i) and 29 CFR § 1926.1153(g)(1)(i).

**Note 3:** Some vacuum system filters must be cleaned manually, while others have automatic filter-cleaning mechanisms.

- f. Employers are prohibited from using compressed air to blow clean clothing or surfaces where that activity can contribute to employee silica exposures, unless it is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air, or no alternative method is feasible. See 29 CFR § 1910.1053(h)(2)(i)-(ii) and 29 CFR § 1926.1153(f)(2)(i)-(ii).



- g. OSHA expects that employers will typically be able to use an alternative cleaning method or compressed air with an appropriate ventilation system; the circumstances in which ventilation systems cannot be used and no other alternative method is feasible are rare. It is the employer's burden to show that it cannot use a ventilation system with the compressed air or that no alternative method is feasible (*see* [GI FAQ #42](#)).
- h. Employers are not prohibited from using compressed air for purposes other than cleaning clothes or surfaces, e.g., for operating a pneumatic tool.

## 2. Inspection Guidelines.

- a. Review the employer's written ECP to ensure that the employer's housekeeping practices are included and properly implemented.
- b. Interview employees regarding housekeeping practices and observe employees' housekeeping activities when possible. CSHOs should use videos and/or photographs to document when permissible housekeeping methods are not used.
- c. If possible, observe the handling of cleaning equipment, such as HEPA-filtered vacuums. Employers should have procedures to clean and/or replace vacuum filters in a way that minimizes exposures.
- d. If compressed air is used to clean surfaces or clothing, CSHOs should determine whether it is being used in conjunction with a ventilation system. The standard does not specify the use of a particular ventilation system for these purposes. Whatever type of supplementary ventilation system is used, it must be able to effectively capture any dust cloud created by the compressed air to prevent dust from entering employees' breathing zones and contributing to silica exposures (*see* [GI FAQs # 43](#)).
- e. If the CSHOs believe there could be exposures exceeding the AL or PEL during housekeeping activities, they should collect personal air samples. The CSHO may also collect a bulk sample to support documentation that the dust contains crystalline silica.
- f. If employees are using compressed air without a ventilation system to clean clothes or surfaces and it appears that it could contribute to employee exposure, CSHOs should determine whether any other alternative cleaning method is feasible. Gather evidence on feasibility of other cleaning methods (e.g., wet sweeping, HEPA-

filtered vacuuming, and using compressed air in conjunction with an adequate ventilation system).

- g. An employer shall not allow dry sweeping or dry brushing, unless wet sweeping, HEPA-filtered vacuuming or other methods that minimize the likelihood of exposure are not feasible. An employer may establish infeasibility for these purposes by providing evidence that wet sweeping, using a HEPA-filtered vacuum, and other methods that minimize the likelihood of exposure would negatively impact the quality of the work being done (*see* [GI FAQ #37](#)).

### 3. Citation Guidelines.

- a. 29 CFR § 1910.1053(h)(1) or 29 CFR § 1926.1153(f)(1) should be cited where:
  - Dry sweeping or dry brushing is used for cleaning where such activity could contribute to employee exposure to respirable crystalline silica; and
  - The employer cannot demonstrate that wet sweeping, HEPA-filtered vacuuming, or other cleaning methods that minimize the likelihood for exposure to respirable crystalline silica are infeasible.
- b. 29 CFR § 1910.1053(h)(2) or 29 CFR § 1926.1153(f)(2) should be cited where:
  - Compressed air is used to clean clothing or surfaces where such activity could contribute to employee exposure to respirable crystalline silica;
  - The compressed air is being used without a ventilation system that effectively captures the dust cloud it creates; and
  - The employer cannot demonstrate that wet sweeping, HEPA-filtered vacuuming, or other cleaning methods that minimize the likelihood of exposure are infeasible.

### J. Medical Surveillance.

- 1. General Information. 29 CFR § 1910.1053(i) and 29 CFR § 1926.1153(h) set forth requirements for the provision of medical surveillance:
  - a. For general industry/maritime, 29 CFR § 1910.1053(i)(1)(i) requires medical surveillance to be made available to each

employee who will be exposed to respirable crystalline silica at or above the AL for 30 or more days per year.

**Note:** From June 23, 2018, until June 22, 2020, the medical surveillance trigger in general industry is exposure above the PEL for 30 or more days per year. Beginning June 23, 2020, the medical surveillance trigger in general industry is exposure at or above the AL for 30 or more days per year.

- b. For construction, 29 CFR § 1926.1153(h)(1)(i) requires medical surveillance to be made available to each employee who will be *required to wear a respirator* by the silica standard for 30 or more days per year.

**Note:** Any partial day of respirator use (e.g., even if for only one hour or less) is considered one day of respirator use.

- The 30-day trigger applies to each individual employer, not the total number of days per year worked by the employee for multiple employers. Respirator use with past employers does not count towards the 30-day trigger. Employers must anticipate the number of days that the employee will be required to wear a respirator under the silica standard while employed by that particular employer.
- c. 29 CFR § 1910.1053(i)(1)(i) and 29 CFR § 1926.1153(h)(1)(i) also require employers to make medical surveillance, including referrals to specialists, available at no cost to the employee and at a reasonable time and place.
  - If medical surveillance requires travel away from the work site, the employer must bear the cost of travel. Employees must be paid for time spent undergoing a medical examination and any tests, including travel time.
- d. Medical surveillance under both standards must be performed by a PLHCP as defined by 29 CFR § 1910.1053(b) and 29 CFR § 1926.1153(b), per 29 CFR § 1910.1053(i)(1)(ii) and 29 CFR § 1926.1153(h)(1)(ii).

## 2. Timing and Frequency.

- a. 29 CFR § 1910.1053(i)(2) and 29 CFR § 1926.1153(h)(2) require employers to make available medical examinations within 30 days after initial assignment to all employees who meet the trigger for medical surveillance, unless the employee has received a medical

examination in accordance with the standard within the past 3 years.

- b. 29 CFR § 1910.1053(i)(3) and 29 CFR § 1926.1153(h)(3) require employers to make medical exams available at least every three years, or more frequently if recommended by the PLHCP, for employees who meet the trigger for medical surveillance under 29 CFR § 1910.1053(i)(1)(i) or 29 CFR § 1926.1153(h)(1)(i).

**Note:** A PLHCP might recommend more frequent medical examinations based on factors such as high exposure levels or a medical finding (e.g., an X-ray suggesting silicosis).

- c. An exam by a specialist must be made available within 30 days after the employer receives a PLHCP's written medical opinion that recommends that examination. *See* 29 CFR § 1910.1053(i)(7) and 29 CFR § 1926.1153(h)(7).
- d. When an employer has previously determined that an employee does not require medical surveillance because his or her exposure is not anticipated to meet the trigger(s) outlined in [Sections IX.J.1.a or b](#) of this Instruction, but a change in process or task, or modification in the frequency of a process or task occurs such that the employee's exposure exceeds the trigger for medical surveillance, then the exam shall be made available as soon as the employer realizes that the trigger will be met.
- e. Employers are required to ensure that the employee receives a copy of the written medical opinion. *See* 29 CFR § 1910.1053(i)(6)(iii) and 29 CFR § 1926.1153(h)(6)(iii). The employer may accept a copy of a written opinion as proof of prior medical surveillance for exposures to respirable crystalline silica.
- f. Employers are generally not required to consider a newly-hired employee's silica exposure experience with any former employer within the previous 12 months when determining whether the new employee must be offered medical surveillance. Except as described in [Section IX.J.2.d](#) above, the medical surveillance trigger is based on the anticipated exposure at each particular employer's establishment(s). However, the trigger for medical surveillance would apply when an employer hires a particular employee for any time during a 12-month period, whether continuous or intermittent, and that employee's assignments result in cumulative silica exposure exceeding a medical surveillance trigger, as described above.
  - Example: If a construction employer intermittently hires the same

employee several times throughout a 12-month period, the employer must consider all the days the employee wears (or is expected to wear) a respirator during that year to determine whether the employee meets the medical surveillance trigger and must offer medical surveillance as soon as it appears that the employee might meet the trigger.

3. Components of the Medical Surveillance Examination.

- a. 29 CFR § 1910.1053(i)(2) and 29 CFR § 1926.1153(h)(2) include the required components of the initial (baseline) examination. The exam must consist of the following:
- A medical and work history including special emphasis on the employee's past, present, and anticipated exposure to silica, dust, and other agents that affect the respiratory system; history of respiratory system dysfunction, including signs and symptoms of respiratory diseases (e.g., shortness of breath, cough, wheezing), history of tuberculosis (TB), and smoking status and history;
  - A physical examination with special emphasis on the respiratory system;
  - A chest X-ray (interpreted and classified by a NIOSH-certified B-reader). For a listing of certified B-readers, medical providers should visit NIOSH's website at: <https://www.cdc.gov/niosh/topics/chestradiography/breader-list.html>;

**Note:** While X-rays can be read remotely, some States require B-readers to be medically licensed in the State in which the X-rays are read. The responsibility lies with the employer to ensure that a NIOSH-certified B-reader is used.

- A pulmonary function test administered by a spirometry technician with a current certificate from a NIOSH-approved spirometry course. For a listing of NIOSH-certified spirometry courses, medical providers should visit NIOSH's website at: <https://www.cdc.gov/niosh/topics/spirometry/approved-course.html>;

**Note:** All providers, including physicians, must complete the NIOSH-approved spirometry training and maintain a current certificate before they can perform the pulmonary function test under the silica standards.

- Testing for latent TB infection; and,

- Any other tests deemed appropriate by the PLHCP.

**Note:** Exposure to respirable crystalline silica increases the risk for developing active pulmonary TB infection in individuals with latent TB infection. Employees who tested positive for latent TB infections are not contagious, but treatment to prevent development of active TB is essential. Therefore, the PLHCP should refer the TB positive employee to the local public health department as required by state law.

#### 4. Other Medical Surveillance Requirements.

- a. Periodic examinations. As explained above, periodic examination must be made available at least every 3 years or more frequently if recommended by the PLHCP for employees who meet the trigger for medical surveillance. The periodic examination shall include all the components of the initial examination noted above except the testing for latent TB infection. *See* 29 CFR § 1910.1053(i)(3) and 29 CFR § 1926.1153(h)(3).
- b. Information provided to the PLHCP or specialist. 29 CFR §§ 1910.1053(i)(4), 1910.1053(i)(7)(ii), 1926.1153(h)(4), and 1926.1153(h)(7)(ii) require the employer to ensure that the PLHCP or any specialist has a copy of the standard and the following information:
  - A description of the employee's former, current, and anticipated duties and levels of exposures as they relate to respirable crystalline silica;
  - A description of any PPE used or to be used by the employee, including when and for how long the employee has used or will use that equipment; and
  - Information from records of employment-related medical examinations previously provided to the employee that are currently within the employer's control.
- c. Written Medical Opinion. 29 CFR §§ 1910.1053(i)(6), 1910.1053(i)(7), 1926.1153(h)(6), and 1926.1153(h)(7) require employers to obtain a written medical opinion from the PLHCP or specialist within 30 days of the examination and to ensure the employee receives a copy of the written medical opinion within 30 days of the exam. The medical opinion must contain only the date of the exam, a statement from the PLHCP that the exam met the requirements of the standard (not applicable to specialists), and any recommended limitations on the employee's use of respirators.

If the employee provided the PLHCP or specialist with *written authorization*, then the written medical opinion for the employer shall also contain any recommended limitations on the employee's continued exposure to silica, and for non-specialists, any recommendation that the employee should be referred to a specialist (see [CON FAQ #47](#)). The silica standard made the release of this information dependent on the employee's authorization to protect employee privacy and encourage employees to participate in medical surveillance by minimizing fears about retaliation or discrimination based on medical findings. Appendix B to the silica standards includes templates for the written medical report, the written medical opinion, and the written authorization.

**Note 1:** CSHOs should be aware that the PLHCP and specialist's written opinion for the employer under the Silica standards differs from that in OSHA's previous substance-specific standards. The difference is that the employee must provide written authorization for the release of certain information. Under other health standards, there is no employee authorization required.

**Note 2:** The standards also require the employer to ensure that the PLHCP or specialist explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of each medical examination performed. The written medical report contains more medical information than the written medical opinion for the employer and is intended under the silica standards to be provided *only* to the employee. See 29 CFR §§ 1910.1053(i)(5), (i)(7)(iii), and 1926.1153(h)(5), (h)(7)(iii).

**Note 3:** If an employer wishes to document an employee's decision to decline a medical examination, the employer could ask the employee to sign a statement affirming that he or she was offered medical surveillance, but declined to participate. If an employee declines a medical evaluation under the respiratory protection standard, then the employer may not assign him or her a task requiring respirator use (see [GI FAQ 49](#)).

## 5. Inspection Guidelines.

- a. The CSHO should determine whether the employer has included the appropriate employees in the medical surveillance program. For example, CSHOs should review the employer's exposure assessment and interview employees to determine whether the employer provided a medical exam.

- b. The CSHO should ask employees about their exposures, respirator usage, entry into regulated areas, and if they were offered medical examinations by their employer. [Appendix E](#) of this Instruction contains a suggested health questionnaire for CSHOs to use.

CSHOs should conduct interviews to determine:

- If the examination took place prior to or within 30 days of beginning the silica work assignments; or
  - If examinations are offered at no cost, if employees are paid for time spent taking examinations, if the employer pays the cost of travel (if any), and if medical testing is offered at reasonable times and places;
  - If the PLHCP or specialist explained the results of the examination and provided a written medical report;
  - If the employee received a copy of the written medical opinion, either from the employer or from the PLHCP or specialist;
  - If the employer has not offered medical surveillance in general industry/maritime establishments, CSHOs should ask employees about the types and frequency of tasks performed. In the construction context, CSHOs should determine how often employees perform tasks requiring respirator use to determine whether they should have been offered medical surveillance; and
  - If the PLHCP recommends that the employee *see* a specialist and the employee authorizes the inclusion of the recommendation in the written medical opinion for the employer, CSHOs should ask the employee whether the employer offered any additional examinations.
- c. If the employee has previously declined a medical examination, an employer may choose to have the employee sign a statement that he or she was offered the exam(s), but declined to participate.

However, the employer must continue to offer a medical examination to each employee who meets the trigger for medical surveillance if the employee requests it, or, at a minimum, the next time an examination is due (*i.e.*, within three years).

- d. The silica standards require employers to make and maintain accurate records for each employee covered by medical surveillance in accordance with 29 CFR § 1910.1053(k)(3) and 29



CFR § 1926.1153(j)(3). These records include a copy of the PLHCP and specialist's medical opinion(s). CSHOs should ask the employer to provide copies of the medical surveillance records including the medical opinions. See [Section IX.L](#) Recordkeeping.

- Whenever reviewing medical reports or opinions, the CSHO should follow OSHA Instruction [CPL 02-02-072](#), *Rules of Agency Practice and Procedure Concerning OSHA Access to Employee Medical Records*, Aug. 22, 2007.
  - Medical records are often kept at a medical provider's office. To verify the content of any medical report that is not available on-site, CSHOs may need to contact the medical provider.
  - For assistance with obtaining a medical access order (MAO) to access employee medical records, communication with healthcare providers, review of the medical surveillance examinations, and interpretation of examination results, contact the Office of Occupational Medicine and Nursing (OOMN) in the National Office. Consider issuing a subpoena for medical records, as necessary.
- e. CSHOs may contact PLHCPs and specialists to determine whether the employer provided them with the information required by the standards.

6. Citation Guidelines.

- a. If medical surveillance was not made available to employees at no cost, and at a reasonable time and place, by general industry/maritime employers in accordance with 29 CFR § 1910.1053(i), or by construction employers in accordance with 29 CFR § 1926.1153(h), the appropriate subparagraph(s) should be cited.
- b. Cite 29 CFR § 1910.1053(i)(1)(i) if no medical surveillance was made available where general industry/maritime employees were exposed at or above the AL for 30 or more days a year beginning June 23, 2020 (or above the PEL for 30 or more days per year from June 23, 2018-June 22, 2020).
- c. Likewise, cite 29 CFR § 1926.1153(h)(1)(i) for construction employees if no medical surveillance was made available when the employee was required to wear a respirator by the silica standard for 30 or more days a year. These citations may be supported through employer and employee statements regarding levels of

exposure, respirator usage, and the employer's exposure assessment data.

- d. Cite 29 CFR § 1910.1053(i)(2) or 29 CFR § 1926.1153(h)(2) if the employer did not ensure the appropriate procedures and tests were provided as part of the employee's initial examination.
- e. Cite 29 CFR § 1910.1053(i)(3) or 29 CFR § 1926.1153(h)(3) if the employer did not make periodic examinations available at least every three years, or more frequently, if recommended by a PLHCP.
- f. Cite 29 CFR § 1910.1053(i)(3) or 29 CFR § 1926.1153(h)(3) if the employer did not ensure the appropriate procedures and tests were provided as part of the employee's periodic examination.
- g. Cite 29 CFR § 1910.1053(i)(4) or 29 CFR § 1926.1153(h)(4) if the employer did not provide the required information to the examining PLHCP. Cite the appropriate subparagraph for the element(s) not provided (e.g., 29 CFR §§ 1910.1053(i)(4)(i)-(iv) or 1926.1153(h)(4)(i)-(iv)).
- h. Cite 29 CFR § 1910.1053(i)(5) or 29 CFR § 1926.1153(h)(5) if the written report was not provided to the employee.
- i. If there was no written opinion provided to the employer, cite 29 CFR § 1910.1053(i)(6)(i) or 29 CFR § 1926.1153(h)(6)(i). If the employer cannot produce a requested written opinion, see the recordkeeping citation guidance in [Section IX.L](#) below.
- j. If employees were not given a written medical opinion within 30 days of their examination, cite 29 CFR § 1910.1053(i)(6)(iii) or 29 CFR § 1926.1153(h)(6)(iii).
- k. Cite 29 CFR § 1910.1053(i)(7) or 29 CFR § 1926.1153(h)(7) if the employer did not provide any required additional medical examination.
- l. If any information is missing from the reports or opinions, CSHOs should cite the appropriate paragraphs.

K. Communication of Hazards.

- 1. General Information. 29 CFR § 1910.1053(j)(1) and 29 CFR § 1926.1153(i)(1) require employers to include respirable crystalline silica in their hazard communication programs in accordance with 29 CFR § 1910.1200, and the program must address at least the following hazards:

cancer, lung effects, immune system effects, and kidney effects. Communication of respirable crystalline silica hazards training is required for each employee covered by the standard (i.e., each employee who is, or could foreseeably be, exposed to respirable crystalline silica at or above the AL).

- a. Hazard communication. The hazard communication requirements of the Silica standards complement existing requirements of OSHA's Hazard Communication standard (HCS), 29 CFR § 1910.1200, which covers employees exposed to respirable crystalline silica regardless of the airborne exposure level. Therefore, the pre-existing duty under the HCS to provide education and training on health hazards associated with silica remains applicable for employees having workplace exposure to silica even at levels below the AL.

Employers must ensure that each employee has access to labels on silica containers and safety data sheets (SDS), and is trained in accordance with the provisions of HCS and 29 CFR § 1910.1053(j)(3) or 29 CFR § 1926.1153(i)(2).

**Note 1:** For more information on the training requirements of the HCS, see [CPL 02-02-079](#), *Inspection Procedures for the Hazard Communication Standard*, [Section X.H.](#), Employee Information and Training, July 9, 2015.

**Note 2:** Under the HCS, employers must maintain SDSs for each hazardous chemical they receive. Where the employer is not able to obtain an SDS for silica-containing materials that are being worked upon by the employees, the employer may use a representative SDS for hazard communication purposes.

- b. Signs. 29 CFR § 1910.1053(j)(2) requires employers to post warning signs at all entrances to regulated areas. (See [Section IX.F.1 \(d\)](#) above).

**Note:** The construction silica standard has no requirement for regulated areas. However, there is a requirement for the employer's ECP to describe procedures used to restrict access to work areas when necessary to minimize the number of employees exposed to silica and the level of employee exposure, including exposures generated by other employers. For more information, see [Section IX.F.1-3](#) of this Instruction regarding 29 CFR § 1926.1153(g)(1)(iv). Even though regulated areas with warning signs are not required for the construction standard, the employer may choose to include procedures for posting warning signs in its written ECP as a method to restrict access to work areas under 29 CFR §

1926.1153(g)(1)(iv).

- c. Employee information and training. The silica standards 29 CFR § 1910.1053(j)(3)(i) and 29 CFR § 1926.1153(i)(2)(i) require employers to ensure that each employee who is covered by the silica standard can demonstrate knowledge and understanding of:
- The health hazards associated with exposure to silica;
  - The specific tasks in the workplace that could result in exposure to silica;
  - The specific measures the employer has implemented to protect employees from exposure to silica (e.g., engineering controls, work practices, and respiratory protection);
  - The contents of the standard; and,
  - The purpose and a description of the medical surveillance program.
- d. The construction standard (29 CFR § 1926.1153(i)(2)(i)(E)) also requires employers to ensure that covered employees can demonstrate knowledge and understanding of the identity of the designated competent person.
- e. The requirement for training is performance-oriented in order to allow flexibility for employers to provide training as needed to ensure that each employee can demonstrate the knowledge and understanding required under the rule:
- Employers can determine whether employees have the requisite knowledge through a variety of methods, such as discussion of the required training subjects, written tests, or oral quizzes (*see* [81 FR at 16845](#)) and ([GI FAQs # 55 and #56](#)); and,
  - The silica standards do not set a fixed schedule for periodic training, however additional or repeated training may be necessary. For example, if an employer observes an employee engaging in activities that contradict the employer's training, it is a sign that the employee may require a reminder or periodic retraining on work practices (*see* [81 FR at 16850](#)).
- f. 29 CFR § 1910.1053(j)(3)(ii) and 29 CFR § 1926.1153(i)(2)(ii) require employers to make a copy of the standard readily available

at no cost to each covered employee.

- Employees' familiarity with and access to the requirements of the relevant respirable crystalline silica standard and their awareness of the employer's obligations to comply with those requirements will allow them to more effectively participate in their own protection.
- g. Acceptable forms of employee training may include hands-on training, videos, slide presentations, classroom instruction, informal discussions during safety meetings, written materials, or any combination of these methods (*see* [GI FAQ #55](#)).
- h. To ensure that employees comprehend the material presented during training, it is critical that trainees have the opportunity to ask questions and receive answers if they do not fully understand the material presented to them (*see* [GI FAQ #55](#)).

2. Inspection Guidelines.

- a. Review the employer's written hazard communication program to determine whether it includes information and training on respirable crystalline silica hazards and associated control measures.
- b. Determine whether an employee can demonstrate knowledge and understanding of silica-related hazards when interviewing employees. The CSHO should gather evidence from employees such as:
  - When they were trained;
  - How the training was conducted;
  - Whether they were able to ask questions and receive answers;
  - Whether the training was conducted in a language and manner they could understand;
  - Whether they were paid for the time it took to complete the training;
  - Whether employees know that respirable crystalline silica is hazardous and where and how exposure could occur;
  - What engineering controls/work practices are used to control

respirable crystalline silica exposures and if the employees can demonstrate how to operate/maintain controls on the equipment they use (if applicable);

- Whether they understand the medical surveillance program;
- Whether a copy of the applicable silica standard(s) is available to them; and,
- For employees in the construction industry, whether they know the identity of the designated competent person.

**Note:** An employer has the option of providing access to the silica standard(s) by means of a printed or electronic copy in a central location or company website. However, when access is provided electronically, the employee must receive training on accessing designated computers that must be available at all times without any barriers to access. The employer should also have a back-up copy of the silica standard(s) should the website not be available.

### 3. Citation Guidelines.

- a. If respirable crystalline silica hazards were not communicated by general industry/maritime employers to their employees in accordance with 29 CFR § 1910.1053(j) or 29 CFR § 1926.1153(i), then cite the appropriate subparagraph(s).
  - If citing 29 CFR § 1910.1200(h)(2)(ii) and 29 CFR § 1910.1200(h)(3)(ii)-(iii), consider grouping with appropriate subparagraphs of 29 CFR § 1910.1053(j)(1) and 1910.1053(j)(3) or subparagraphs of 29 CFR § 1926.1153(i)(1) and 1926.1153(i)(2).
- b. If the required hazard warning signs were not posted at all entrances to the regulated area(s) by general industry/maritime employers, then cite grouped violations of 29 CFR § 1910.1053(j)(2) and 1910.1053(e)(2)(ii).
- c. When covered employees received inadequate respirable crystalline silica information or training (e.g., when the covered employees cannot demonstrate knowledge and understanding of required information), cite 29 CFR § 1910.1053(j)(3)(i) or 29 CFR § 1926.1153(i)(2)(i), as appropriate.
- d. If the employer did not make a copy of the relevant silica standard readily available to affected employees without cost, cite

29 CFR § 1910.1053(j)(3)(ii) or 29 CFR § 1926.1153(i)(2)(ii), as appropriate.

L. Recordkeeping.

1. General. 29 CFR § 1910.1053(k) and 29 CFR § 1926.1153(j) require employers to make and maintain accurate records of air monitoring data, objective data, and medical surveillance. Employers must both *create and preserve* such records.
  - a. 29 CFR §§ 1910.1053(k)(1)(iii), (k)(2)(iii), and (k)(3)(iii) and 1926.1153(j)(1)(iii), (j)(2)(iii), and (j)(3)(iii) require employers to ensure that air monitoring data, objective data, and medical surveillance records are maintained and made available in accordance with 29 CFR § 1910.1020, Access to employee exposure and medical records. Therefore, employers must grant access to these records upon request by employees, their designated representatives, or OSHA, as required by 29 CFR § 1910.1020(e).
  - b. The requirement to make and maintain air monitoring and objective data records only arises where the employer relies upon such data to comply with the requirements of the silica standards. *See* 29 CFR § 1910.1053(k)(2)(i) and 29 CFR § 1926.1153(j)(2)(i). *See below* for a more detailed discussion.
  - c. OSHA standards no longer require that air monitoring data and medical surveillance records include the employee's social security number (SSN). An employer may still choose to use SSNs to identify employees but the numbers should be expunged from the records prior to allowing other parties access to the exposure records. An employer may develop an alternative method for identifying employees' individual records.

**Note:** Recognizing the threat of identity theft and the availability of other methods for tracking employees for research purposes, OSHA published a rule that removed the requirements for employers to include employee social security numbers on exposure monitoring, medical surveillance, and other records from most OSHA health standards, including the Silica standards. *See* [Standards Improvement Project--Phase IV, 84 FR 21451 \(May 14, 2019\)](#).

- d. 29 CFR § 1910.1020 generally requires that employee exposure records be preserved for at least 30 years, and that an employee's medical records be kept for the duration of the employee's

employment plus an additional 30 years.

e. *Medical Record retention exceptions:* There are special rules that may apply to the retention of employee medical records under certain circumstances:

- The medical records of employees who have worked for the employer for less than one year need not be retained beyond the term of employment *if* they are provided to the employee upon the termination of employment (*see* 29 CFR § 1910.1020(d)(1)(i)(C));
- Employers are responsible for maintaining medical records in their possession and in the PLHCP or specialist's possession (*e.g.*, the written medical report for the employee described in 29 CFR § 1910.1053(i)(5) and 29 CFR § 1926.1153(h)(5) (*see* [GI FAQ #58](#) [CON FAQ #53](#))).
- For records that are in the possession of the PLHCP or the specialist, employers can fulfill their obligations for record retention by including the retention requirement in the written agreement between the employer and the PLHCP or the specialist or by otherwise specifically communicating to the PLHCP or the specialist the substance of OSHA's record-retention requirements (*see* [GI FAQ #58](#), [CON FAQ #53](#), and [81 FR at 16854](#)).
- If an examination meeting the requirements of the silica standards was offered to the employee by a previous employer and a new employer accepts a written medical report or opinion as proof of the examination, the new employer is NOT responsible for record retention by the PLHCP who conducted the examination for the previous employer. However, the new employer must maintain the written report or opinion he/she accepted from the employee.

f. In accordance with 29 CFR § 1910.1020(h)(1), employers ceasing to do business must transfer all employee exposure and medical records to the successor employer, whenever applicable. If there is no successor, then the employer who is ceasing to do business must notify affected current employees of their rights to access the records at least three months prior to the cessation. The employer should also make a good faith attempt to locate previous employees to provide them their records prior to disposal.

## 2. Specific requirements.

a. 29 CFR § 1910.1053(k)(1) and 29 CFR § 1926.1153(j)(1) require employers who perform air monitoring to assess employee



exposures to make and maintain accurate records of such monitoring that identify the monitored employee(s) and all employees whose exposures are represented by the monitoring. The employer is required to keep records for each exposure measurement taken. Specifically, 29 CFR § 1910.1053(k)(1)(ii) and 29 CFR § 1926.1153(j)(1)(ii) require the records to include the following information:

- The date of measurement for each sample taken;
  - The task involving exposure to respirable crystalline silica that was monitored;
  - Sampling and analytical methods used;
  - The number, duration, and results of samples taken;
  - Identity of the laboratory that performed the analysis;
  - The type of PPE used by the employees monitored; and,
  - The name and job classification of all employees represented by the monitoring, indicating which employees were actually monitored (*see* [GI FAQ #23](#)).
- b. Sections 1910.1053(k)(2) and 1926.1153(j)(2) require employers who use objective data to characterize employee exposures to make and maintain accurate records of this data. Specifically, 29 CFR § 1910.1053(k)(2)(ii) and 29 CFR § 1926.1153(j)(2)(ii) require the records to include the following specific information:
- The crystalline silica-containing material in question;
  - The source of the objective data;
  - The testing protocol and results of testing;
  - A description of the process, task, or activity involved; and
  - Other data relevant to the process, task, activity, material, or employee exposures on which the objective data were based.
- c. 29 CFR § 1910.1053(k)(3) and 29 CFR § 1926.1153(j)(3) require employers to establish and maintain an accurate medical surveillance record for each employee subject to the medical surveillance requirements. Specifically, 29 CFR §

1910.1053(k)(3)(ii) and 29 CFR § 1926.1153(j)(3)(ii) require the records to include the following specific information:

- The employee's name;
- A copy of the PLHCPs' and specialists' written medical opinions; and,
- A copy of the information provided to the PLHCPs and specialists.

**Note:** Employers have the flexibility to develop a system to uniquely identify employees who were monitored or included in medical surveillance.

3. Inspection Guidelines.

- a. The CSHO should review the employer's recordkeeping including the employer's air monitoring and objective data records.
  - If the employer has taken air monitoring samples to assess employee exposure, the CSHO should review the employer's air monitoring data to determine whether the employer is keeping an accurate record of all measurements taken as set forth in 29 CFR § 1910.1053(k)(1) and 29 CFR § 1926.1153(j)(1). If the employer is relying on objective data to assess employee exposure, the CSHO should review the objective data records for compliance with 29 CFR § 1910.1053(k)(2) and 29 CFR § 1926.1153(j)(2). Where an employer's objective data includes air monitoring data taken by the employer to assess employee exposure, the CSHO should ensure that the employer's records comply with both 29 CFR § 1910.1053(k)(1) and paragraph (k)(2) or 29 CFR § 1926.1153(j)(1) and paragraph (j)(2). In general industry, the CSHO should also review an employer's objective data relied on to demonstrate that the silica standard does not apply per 29 CFR § 1910.1053(a)(2);
- b. The CSHO should also review the employer's medical surveillance records for employees exposed to respirable crystalline silica. Whenever reviewing medical opinions, the CSHO should follow OSHA Instruction [CPL 02-02-072](#), *Rules of Agency Practices and Procedure Concerning OSHA Access to Employee Medical Records*, Aug. 22, 2007.
- c. *Retention:* The records should be examined to determine whether the employer is keeping employee exposure records for 30 years and employee medical records for the duration of employment plus 30 years. See [Section IX.L.1.e](#) regarding rules for retention of

medical records under special circumstances.

4. Citation Guidelines.

- a. If the employer is relying on air monitoring data, but has not maintained the air monitoring data records or the records are missing certain required elements:
  - Cite 29 CFR § 1910.1053(k)(1)(i) or 29 CFR § 1926.1153(j)(1)(i) for not maintaining the air monitoring records; and
  - Cite 29 CFR § 1910.1053(k)(1)(ii) or 29 CFR § 1926.1153(j)(1)(ii) if the air monitoring records are missing certain elements.
- b. If the employer is relying on objective data but has not maintained records of the objective data:
  - For general industry/maritime, cite 29 CFR § 1910.1053(k)(2)(i);
  - For construction, cite 29 CFR § 1926.1153(j)(2)(i).
- c. If the employer's objective data records are missing certain required elements:
  - For general industry/maritime, cite 29 CFR § 1910.1053(k)(2)(ii);
  - For construction, cite 29 CFR § 1926.1153(j)(2)(ii).
- d. If the employer has not made or maintained required medical surveillance records:
  - For general industry/maritime, cite 29 CFR § 1910.1053(k)(3)(i);
  - For construction, cite 29 CFR § 1926.1153(j)(3)(i).
- e. If the records are missing certain required elements (e.g., physician's written opinion):
  - For general industry/maritime, cite 29 CFR § 1910.1053(k)(3)(ii);
  - For construction, cite 29 CFR § 1926.1153(j)(3)(ii).
- f. If the employer is not maintaining records of air monitoring data, objective data, or medical surveillance records in accordance with 29 CFR § 1910.1020 (for example, if employees' air monitoring records were not being maintained):

- For general industry/maritime, cite 29 CFR § 1910.1053(k)(1)(iii), (k)(2)(iii), or (k)(3)(iii) and group with the appropriate provision of 29 CFR § 1910.1020(d)(1)(i) or 1910.1020(d)(1)(ii);
- For construction, cite 29 CFR § 1926.1153(j)(1)(iii), (j)(2)(iii), or (j)(3)(iii), and then group with the appropriate provision of 29 CFR § 1910.1020(d)(1)(i) or 1910.1020(d)(1)(ii).

**Note:** All appropriate subparagraphs should be cited if the records are missing more than one of the required elements.

M. Dates.

1. 29 CFR § 1910.1053(l) and 29 CFR § 1926.1153(k) establish effective and compliance dates.
  - a. The Respirable Crystalline Silica standards became effective June 23, 2016.
  - b. The compliance dates for the general industry/maritime standard are as follows:
    - Except as outlined below, employers must comply with all the requirements of the general industry/maritime standards by June 23, 2018;
    - The requirement to make medical surveillance available to employees who are occupationally exposed to respirable crystalline silica at or above the action level for 30 days or more per year, per 29 CFR § 1910.1053(i)(1)(i), became enforceable June 23, 2020;
    - The obligation to make medical surveillance available to employees who are occupationally exposed to respirable crystalline silica above the PEL for 30 days or more per year, per 29 CFR § 1910.1053(i)(1)(i), was enforceable from June 23, 2018 to June 22, 2020.
  - c. For hydraulic fracturing operations in the oil and gas industry, the engineering and work practice control requirements in 29 CFR § 1910.1053(f)(1) become enforceable on June 23, 2021. *See [Appendix G](#)* for hydraulic fracturing inspection guidelines.
  - d. The compliance dates for construction standards are as follows:

- OSHA began enforcing the construction standard on September 23, 2017 (i.e., subject to an extension from the original compliance date, which was June 23, 2017);
- The requirements for methods of sample analysis (in 29 CFR § 1926.1153(d)(2)(v)) commenced on June 23, 2018.

## **X. Multi-Employer.**

### **A. Overview.**

1. In a situation where workers from different employers are simultaneously exposed to respirable crystalline silica hazards, enforcement may be subject to the OSHA multi-employer citation policy. These scenarios are most likely to occur on construction sites. See OSHA Instruction [CPL 02-00-124](#), *Multi-Employer Citation Policy*, December 10, 1999. The directive's guidance and citation policies provide information on the need for employers to communicate and protect against hazardous conditions workers may be exposed to when working with respirable crystalline silica.
2. At multi-employer worksites (in all industry sectors), more than one employer may be citable for a hazardous condition that violates an OSHA standard. A two-step process is followed in determining whether more than one employer is to be cited:
  - a. *Step 1:* Determine whether the employer is a creating, exposing, correcting, or controlling employer. See Sections X.B, X.C, X.D, and X.E of OSHA's Multi-Employer Citation Policy for more information about and examples of each of these types of employers. If the employer falls into one of these categories, it has obligations under the silica standards.
  - b. *Step 2:* Determine if the employer's actions were sufficient to meet those obligations. The extent of the actions required of employers varies based on which category applies.
3. Communication of hazards to other employers is part of an employers' duties under its written hazard communication program. This includes, among other things, the methods the employer will use to inform others of any precautionary measures to protect employees. See 29 CFR § 1910.1200(e)(2)(ii).
4. CSHOs should carefully evaluate scenarios where a single silica-related task exposes employees of multiple employers. Ensure that employees are

protected, including that they are provided with and wear the appropriate PPE.

**Note:** Employers covered by the construction standard must establish and implement procedures to restrict access to work areas, where necessary (e.g., when respirator use is required), to minimize the number of employees exposed to respirable crystalline silica and their level of exposure, including exposures generated by other employers or sole proprietors. *See* 29 CFR § 1926.1153(g)(1)(iv).

B. Inspection Guidelines.

1. Inspection procedures outlined in this Instruction may apply to multi-employer work sites. During opening conferences on all silica-related construction inspections, CSHOs should:
  - a. Determine the names of all contractors involved in tasks potentially generating respirable crystalline silica and whose employees are engaged in such tasks.
  - b. Review relevant documentation including, but not limited to, the minutes from any safety meeting where respirable crystalline silica exposures were discussed; as well as the ECP and a copy of the written hazard communication program.
  - c. Determine through interviews and observations whether other contractors are exposed to respirable crystalline silica. If so, proceed as instructed in the applicable sections of this Instruction.

C. Citation Guidelines.

- a. All the citation guidelines mentioned in this Instruction apply to multi-employer citations (i.e., when applicable several employers can be cited for the same violation).
  - *Example 1:* Two workers engaged in a sandblasting activity are exposed to silica exposure levels above the PEL. While doing the walkaround, the CSHO also observed carpenters working in the area exposed to the silica hazards. If the conditions violate the silica standard, both employers may be cited. For example, the sandblasting contractor for creating the hazard and exposing its workers, and the carpenters' employer for exposing their workers to the silica hazard.
  - *Example 2:* The CSHO observed carpenters (on-site contractors) working in areas generating silica at a general industry site and the

host employer's employees were also being subjected to silica exposures; both employers may be cited for failing to protect their workers.

**XI. Temporary Workers.** (See [GI FAQs](#) #59 to #64).

**A. Overview.**

1. Host employers that use staffing agencies that supply temporary workers have obligations to ensure compliance with the Silica standards, as both the host and the staffing agency are considered joint employers of those workers.
2. Temporary workers are entitled to the same protections as other employees under the Occupational Safety and Health Act and OSHA health and safety standards. Therefore, temporary workers within the scope of the Silica standards must be protected as required by the standard. The duration of their employment is irrelevant.
3. Staffing agencies and host employers are responsible for determining the conditions of employment and for complying with the Silica standards. Both share control over temporary employees, and are therefore responsible for ensuring that these employees are effectively informed and trained on workplace hazards.
4. Some worksite-specific training is always required, and host employers are generally better situated to provide training on worksite-specific job tasks, machinery, equipment, processes, and measures taken to protect workers.
5. The staffing agency and the host employer must communicate and coordinate to ensure that the temporary workers are fully protected under the standard. While the host employer is often better situated to assess hazards and protect temporary workers from silica-related hazards in the workplace, the staffing agency may be better positioned to offer other protections under the silica standard, such as general training and medical surveillance.
6. Host employers must ensure that the exposures of temporary workers are assessed when required by 29 CFR § 1910.1053(d)(1) or 29 CFR § 1926.1153(d)(2) and ensure that they are not exposed to silica above the PEL.
7. A general industry host employer has no obligation to make medical surveillance available to temporary workers who will not be occupationally exposed to silica at or above the applicable threshold for 30

or more days per year while working for the host employer. If the temporary worker will be exposed above the threshold for 30 days or more at the host site, and the worker has not had a medical examination that meets the requirements of the standard within the last three years, the host employer and staffing agency must ensure that medical surveillance is available. *See* 29 CFR § 1910.1053(i)(1)(i) and paragraph (i)(3).

8. In construction, if the temporary worker will be required to wear a respirator while working for the host employer for 30 or more days per year, and the worker has not had a medical examination that meets the requirements of the standard within the last three years, the construction host employer and staffing agency must ensure that medical surveillance is available. *See* 29 CFR § 1926.1153(h)(1)(i) and (h)(3).
9. The staffing agency must determine the total days per year of exposure above the threshold (in general industry) or the total days per year of respirator use (in construction) during all periods of employment with all host employers and must add those days together to determine whether medical surveillance must be made available to a temporary worker.

**Note:** Employers decide whether a division of compliance responsibilities may be appropriate. In doing so, the staffing agency and host employer should jointly review the task assignments and potential workplace hazards. The details of the training and protective measures to be provided may be set forth contractually. However, neither employer may avoid its duties under the OSH Act by shifting responsibilities to the other employer.

**B. Inspection Guidelines.**

1. During all silica-related inspections, CSHOs should determine whether there are temporary employees that are exposed to respirable crystalline silica.

**Note:** CSHOs should request and review relevant documentation such as any agreements between the host employer and the temporary agency to help determine their responsibilities.

2. If any temporary workers are exposed to silica-related hazards, follow the guidance in the applicable sections of this directive.
3. CSHOs should gather evidence and determine whether the host employer has provided the following:
  - a. Host employers must ensure that the exposures of temporary workers who are or may reasonably be expected to be exposed to



silica at or above the AL are assessed using either the general industry/maritime performance option in 29 CFR § 1910.1053(d)(2) or the scheduled monitoring option in 29 CFR § 1910.1053(d)(3), or the construction options in 29 CFR § 1926.1153(d)(2)(ii) or paragraph (d)(2)(iii), where applicable.

- b. Host employers using the performance option may rely on the same objective and/or air monitoring data used to assess the exposures of permanent employees, as long as such data accurately characterize the exposures of the temporary workers. *See* 29 CFR § 1910.1053(d)(2) or 29 CFR § 1926.1153(d)(2)(ii).
- c. Host employers using the scheduled monitoring option may rely upon representative sampling to assess the exposures of temporary workers if they are performing the same tasks on the same shift and in the same work area as the employees whose exposures have been sampled. (Representative sampling involves sampling the employees expected to have the highest silica exposures.) *See* 29 CFR § 1910.1053(d)(3)(i) or 29 CFR § 1926.1153(d)(2)(iii)(A).
- d. Host employers must ensure that temporary workers are not exposed to silica above the PEL, using the hierarchy of controls set forth in the standard. Where respiratory protection is required, the host employer and the staffing agency should reach agreement as to which employer will provide and pay for the respirators.

**Note:** Although the host employer is often better situated to assess and control workplace hazards than the staffing agency, both parties may agree to have the staffing agency provide respirators, as well as medical evaluations and fit testing required for respirator use, in accordance with section 1910.134.

- e. OSHA recommends that staffing agencies and host employers coordinate responsibilities for the various aspects of silica-related training and inform each other when they have fulfilled their respective training obligations. *See:*  
[https://www.osha.gov/temp\\_workers/index.html](https://www.osha.gov/temp_workers/index.html) and  
<https://www.osha.gov/Publications/OSHA3859.pdf>.
- f. Staffing agencies and host employers should also review OSHA's Temporary Worker Initiative (TWI) Bulletin No. 5 - Hazard Communication, for further guidance:  
<https://www.osha.gov/Publications/OSHA3860.pdf>

C. Citation Guidelines.

- 1. The citation guidelines in this directive apply to the host employer, the

staffing agency, or both, depending on the employment agreement and case-specific circumstances. Where applicable, both entities may be cited for the same violation.

- The CSHO should cite the staffing agency and the host employer under 29 CFR § 1910.1053(j) or 29 CFR § 1926.1153(i) if no effort was made to determine what kind of work tasks/operations the workers would be performing at the host site.
  - The CSHO should cite the host employer under 29 CFR § 1910.1053(j) or 29 CFR § 1926.1153(i) if it did not provide the necessary site-specific training.
2. Issuance of citations to staffing agencies are to be evaluated on a case-by-case basis.

## **XII. Drafting OSHA Citations for Silica Violations.**

- A. The compliance officer should follow the general procedures for writing OSHA citations in the FOM, [CPL 02-00-164](#), and any specific procedures in this Respirable Crystalline Silica Directive. The recommended classification of violations shall be as per the FOM, Violations, Chapter 4, or as per subsequent revisions. Violations of the Silica standards will generally be classified as “serious” given the potential for severe impairment of health.

OSHA has developed Standard Alleged Violation Elements (SAVEs) specific to the Silica standards for use by compliance officers to ensure consistent writing of citations. If there is no SAVE that covers the alleged violation, the compliance officer shall develop the alleged violation description using existing procedures. (See OSHA Instruction [CPL 02-00-035](#), *Changes to Regulatory and General Industry Standard Alleged Violation Elements (SAVEs) Manual*.)

The general procedures for classifying and grouping violations in the FOM should be followed. This Instruction also contains some specific instructions for grouping violations of multiple provisions within the Silica standards and for grouping violations of one or more provisions of a Silica standard and other OSHA standards. Deviations that appear appropriate, however, may be addressed with the Regional Office.

## **XIII. Training for OSHA Personnel.**

- A. For all inspections or on-site visits where silica exposures are expected, CSHOs and OSHA consultation staff are expected to be knowledgeable of:
1. Potential hazards which may be encountered at the site, including the potential hazards of silica.

2. Contents of the Silica standards and this Instruction.
3. Appropriate PPE to be worn. Each CSHO/OSHA consultation staff who will be expected to use PPE shall be trained in the proper care, use, and limitations of the PPE. Use of respiratory protection by CSHOs and other Agency personnel is addressed in OSHA Instruction [CPL 02-02-054](#), *Respiratory Protection Program Guidelines*, July 14, 2000.

**XIV. Medical Examinations for OSHA Personnel.**

- A. Many of the hazards CSHOs may encounter are specifically addressed by the medical surveillance requirements in OSHA standards. In accordance with OSHA personnel policy in OSHA Instruction [PER 04-00-005](#), *OSHA Medical Examination Program*, Aug. 22, 2009, Regional Administrators and Area Directors (AD) are responsible for implementing a medical examination program for CSHOs.
- B. OSHA Instruction [CPL 02-02-054](#), *Respiratory Protection Program Guidelines*, July 14, 2000, includes medical evaluation requirements for OSHA personnel required to wear respiratory protection. The instruction requires that CSHOs be medically evaluated and found eligible to wear the respirator selected for their use prior to fit testing and first-time use of the respirator in the workplace. CSHOs who are required to wear any respiratory protection shall be medically cleared via the CSHO Medical Examination procedures.

**XV. Protection of OSHA Personnel.**

- A. CSHOs must use appropriate PPE when they are exposed to a hazard. CSHOs shall not enter a respirable crystalline silica-regulated area, or other area where exposures are likely to exceed the PEL, unless it is absolutely necessary. If necessary, CSHOs should first discuss the need with their AD or Assistant Area Director prior to entering. For inspection and air sampling activities, remote operations are encouraged when practical.
- B. Personal Protective Equipment (PPE).
  1. Regional Administrators and ADs shall ensure that appropriate PPE is available for CSHOs.
  2. CSHOs shall wear appropriate respiratory protection in the unlikely event of entering a respirable crystalline silica-regulated area or other area where exposures are likely to exceed the AL.
  3. In some instances, a CSHO may find that an employer's exposure assessment is inadequate, has not been performed at all, the employer has not fully and properly implemented Table 1 controls, or exposures may

exceed the PEL. In such cases, use professional judgment in anticipating exposure during a brief entry into a silica-related work area for inspection. CSHOs shall comply with the Regional or Area Office's respiratory protection program.

4. Respirators shall be selected in accordance with the respirator selection procedures in [CPL 02-02-054](#), *Respiratory Protection Program Guidelines*, July 14, 2000. Respirators shall also meet OSHA's APFs, as set forth in 29 CFR § 1910.134.
5. CSHOs should refer to the Safety and Health Management System (SHMS) for OSHA employees, Chapter 27, Exposure Monitoring, for further guidance on PPE and employee exposure sampling:  
<https://www.osha.gov/enforcement/directives/adm-04-00-003>

#### **XVI. OSHA Information System (OIS) Coding Instructions.**

- A. All OSHA inspections (i.e., complaints, referrals, NEP) involving respirable crystalline silica shall be coded "RCS-NEP." All previous IMIS/OIS codes including "N-02-Silica" shall not be used.
- B. Refer to the appropriate inspection classification fields in the OIS Enforcement User Guide for further guidance.

## Appendix A

### **Flow Charts for Evaluating Construction Employer Methods of Controlling Exposure to Respirable Crystalline Silica**

#### **Flowchart A: Specified Exposure Controls for Table 1 Tasks**

In general, if employees are performing Table 1 tasks, and the employer has not implemented controls, *and* has not conducted an exposure assessment, then the employer is in violation of paragraphs (c) and (d). For each employee with occupational exposure to respirable crystalline silica (RCS), CSHOs should consider the following questions.

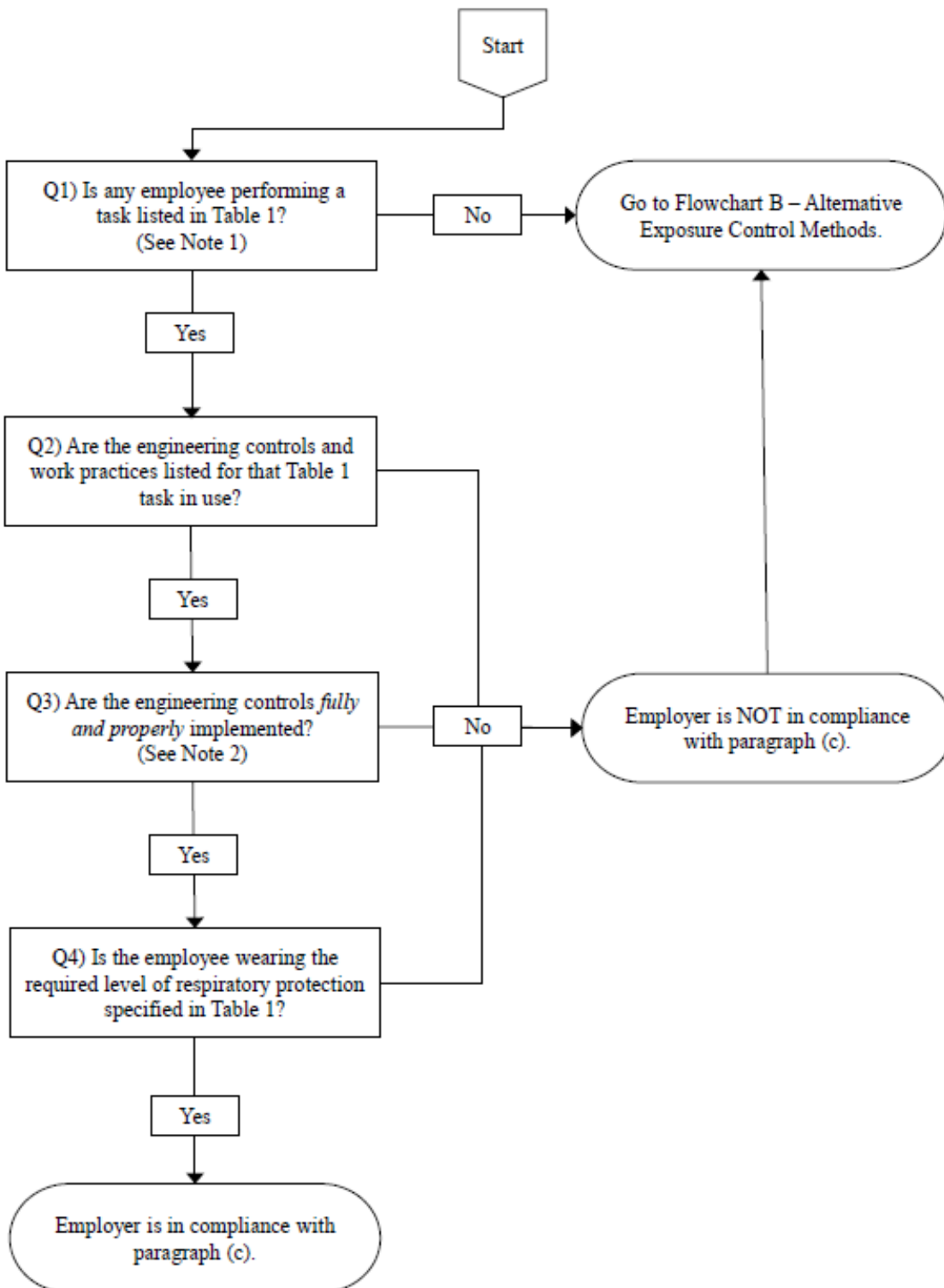
1. Is any employee performing a task listed in Table 1?  
If Yes, go to Q2.  
**If No, evaluate compliance with 29 CFR § 1926.1153(d) – see Flowchart B.**
2. Are the engineering controls and work practices listed for that Table 1 task in use?  
If Yes, go to Q3.  
**If No, evaluate compliance with 29 CFR § 1926.1153(d) – see Flowchart B.**
3. Are the engineering controls *fully and properly* implemented?  
If Yes, go to Q4.  
**If No, evaluate compliance with 29 CFR § 1926.1153(d) – see Flowchart B.**
4. Is the employee wearing the required level of respiratory protection?  
If Yes, employer is in compliance with Table 1.  
**If No, evaluate compliance with 29 CFR § 1926.1153(d) – see Flowchart B.**

**Note 1:** CSHOs should repeat Flowchart A for each employee engaged in a Table 1 task.

**Note 2:** To determine whether the engineering controls, work practices, and respiratory protection specified in Table 1 are *fully and properly* implemented, CSHOs should consult 29 CFR § 1926.1153(c)(2), which contains additional requirements for tasks performed indoors or in an enclosed area, and for control measures involving wet methods or an enclosed cab or booth. CSHOs should also consult equipment manufacturer's instructions to ensure the equipment is operated and maintained in accordance with manufacturer's instructions to minimize dust emissions.

**Note 3:** In determining the respiratory protection required by Table 1, CSHOs should note that Table 1 may specify different respirator requirements for tasks performed  $\leq 4$  hours/shift and  $> 4$  hours/shift. 29 CFR § 1926.1153(c)(3) contains additional instructions regarding how task duration should be calculated for the purposes of respirator usage where an employee performs more than one task on Table 1 during the course of a shift.

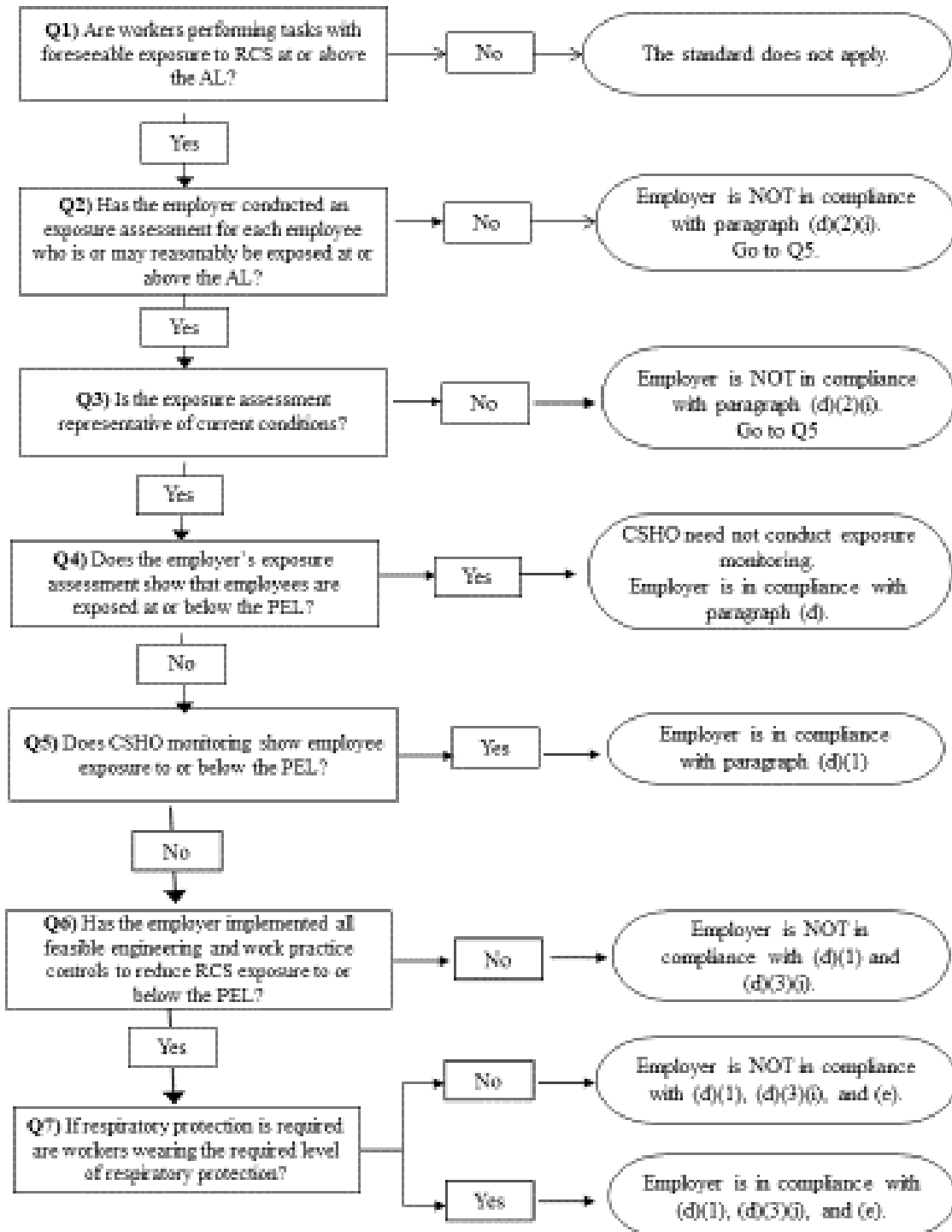
**Flowchart A: Specified Exposure Controls for Table 1 Tasks**



## Flowchart B: Alternative Exposure Control Methods

1. Are workers performing tasks with foreseeable exposure to RCS at or above the action level? (Note that the use of engineering controls to maintain exposure below the AL indicates that the standard covers the operation.)  
If Yes, go to Q2.  
**If No, the standard does not apply to exposures that will remain below the AL under any foreseeable conditions.**
2. Has the employer conducted an exposure assessment for each employee who is or may reasonably be expected to be exposed at or above the AL?  
If Yes, go to Q3.  
**If No, the employer is not in compliance with paragraph (d)(2)(i). Conduct exposure monitoring as necessary to assess compliance with PEL and go to Q5.**
3. Is the exposure assessment representative of current conditions?  
If Yes, the employer is in compliance with (d)(2)(i); go to Q4.  
**If No, the employer is not in compliance with paragraph (d)(2)(i). Conduct exposure monitoring as necessary to assess compliance with PEL and go to Q5.**
4. Does the employer's exposure assessment show that employees are exposed at or below the PEL?  
If Yes, the CSHO need not conduct exposure monitoring and the employer is in compliance with paragraph (d).  
**If No, the CSHO should conduct exposure monitoring, and go to Q5.**
5. Does CSHO exposure monitoring show employee exposure at or below the PEL?  
If Yes, the employer is in compliance with paragraph (d)(1).  
**If No, go to Q6.**
6. Has the employer implemented all feasible engineering and work practice controls to reduce RCS exposure to or below the PEL?  
If Yes, go to Q7.  
**If No, the employer is not in compliance with paragraphs (d)(1) and (d)(3)(i).**
7. If respiratory protection is required, are workers wearing the required level of respiratory protection?  
If Yes, the employer is in compliance with paragraphs (d)(1), (d)(3)(i), and (e).  
**If No, the employer is not in compliance with paragraphs (d)(1), (d)(3)(i), and (e).**

**Flowchart B: Alternative Exposure Control Methods**





## Appendix B

### Instructions for Air Samples

Air samples are collected by drawing workplace air through a pre-weighed 37-mm diameter low ash polyvinyl chloride (PVC) filter with a 5- $\mu$ m pore size preceded by 10-mm nylon Dorr-Oliver cyclone, following the procedures described in OSHA Method ID-142.<sup>1</sup> Each PVC filter is housed in an assembly composed of an aluminum cowl and a stainless steel support ring. The assembly is encapsulated in a plastic cassette.

#### Pump Calibration:

When operated at the experimentally determined sampling rate of 1.7 l/min, Dorr-Oliver cyclones are capable of sampling only particulates that are in the respirable size range. Therefore, calibration of the air flow rate is of critical importance when using cyclones to sample respirable particulate. The personal sampling pump must be calibrated with a representative filter in-line, following the procedure described in the OSHA Technical Manual.<sup>2</sup> The required air flow rate is 1.7 L/min. Samples collected using other sampling rates are considered non-respirable because the particle-size fractions do not conform to the specified size definition.<sup>3</sup>

When calibrating the sampling pump, use a separate filter; do not use the actual filter intended for compliance sampling.

Assemble the sampler as shown in Figure 1. Draw air directly into the inlet of the cyclone and through the filter cassette (inlet side down). The air should not pass through any hose or tubing before entering the cyclone.

During sampling, do not invert the sampler. Instruct the person being sampled not to invert the sampler.

Inverting the cyclone can cause oversize material from the cyclone grit pot to spill onto the filter. Incorrect positioning of the sampling apparatus can interfere with sampling. The cyclone must be mounted vertically

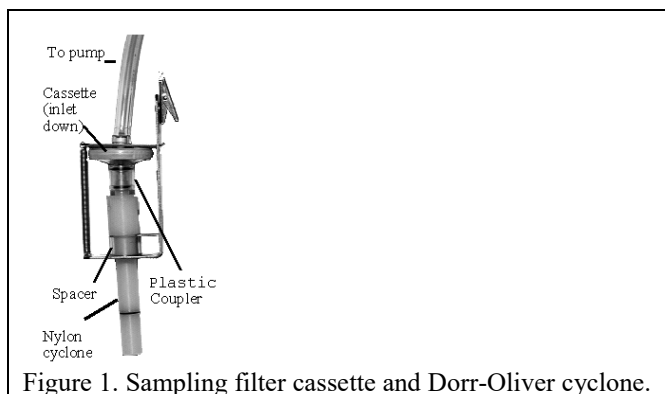


Figure 1. Sampling filter cassette and Dorr-Oliver cyclone.

<sup>1</sup> Stones, F., Robinson, E., Johansen, D., Albrecht, B. Crystalline Silica Quartz and Cristobalite (OSHA ID-142), 2016. U.S. Department of Labor, Occupational Safety and Health Administration. [https://www.osha.gov/dts/sltc/methods/inorganic/id142/id142\\_v4.html](https://www.osha.gov/dts/sltc/methods/inorganic/id142/id142_v4.html) (accessed November 2019).

<sup>2</sup> OSHA Technical Manual (OTM). United States Department of Labor, Occupational Safety and Health Administration. [https://www.osha.gov/dts/osta/otm/otm\\_ii/otm\\_ii\\_1.html#appendix\\_II\\_6](https://www.osha.gov/dts/osta/otm/otm_ii/otm_ii_1.html#appendix_II_6) (accessed November 2019).

<sup>3</sup> Ettinger, H. J., Partridge, J. E., Royer, G. W. Calibration of Two-Stage Air Samplers. *Am. Ind. Hyg. Assoc. J.*, 1970, 31, 537-545.

with the cyclone inlet facing outward. The grit pot must not become overloaded and the cyclone inlet must remain unobstructed.

After sampling for the appropriate time, disconnect the sampler from the sampling pump and seal the filter cassette with end plugs. Seal the sampler with a Form OSHA-21. Submit at least one blank sample with each set of samples. Handle the blank sample in the same manner as the other samples, except draw no air through it.

Record sample air volume (L), sampling time (min), and sampling rate (L/min) for each sample, along with any potential interferences on the OSHA Sampling Sheet. Submit samples to the OSHA Salt Lake Technical Center (SLTC). Request analysis for silica, crystalline, mixed respirable (quartz, cristobalite, tridymite), IMIS code 9000. Cristobalite is a polymorph of respirable crystalline silica that occurs in workplaces where silica is heated to extremely hot temperatures (>1460 °C). If it is suspected that cristobalite may be present, note this on the OSHA Sampling Sheet.

Bulk sampling is optional. In cases where bulk samples are submitted, any of the following are acceptable in decreasing order of preference:

- 1) High-volume filter sample without cyclone (preferably >1.0 g). This is an air sample taken without a cyclone using a sampling rate greater than what is recommended. This results in the sampling of a larger air volume. It is submitted and identified for analysis as a bulk sample.
- 2) Representative settled dust (e.g., rafter sample). Submit 1-20 grams of bulk sample in a 20-ml glass scintillation vial sealed with a PTFE-lined cap.
- 3) Sample of the bulk material in the workplace. Submit 10-20 grams of bulk sample in a 20-ml glass scintillation vial sealed with a PTFE-lined cap.

If bulk samples are taken, seal the sample with a Form OSHA-21. Identify the composition of the sample (if known) on an OSHA Sampling Sheet and identify the air samples that are associated with the bulk sample(s). The applicable IMIS code for bulk samples S103 (silica (quartz, total), or S105 (silica (cristobalite, total), must be used. **Ship bulk samples separately from air samples.** Bulk samples can be used to confirm the presence of crystalline silica at the worksite. Bulk samples **cannot** be used to determine exposure levels to respirable crystalline silica.

#### OSHA Sampling Sheet:

OSHA SLTC will analyze all silica samples submitted with IMIS code 9000 for quartz. Cristobalite is rare and will usually only be analyzed if the reason to suspect its presence is noted on the OSHA Sampling Sheet. Tridymite, which is even rarer, will **not** be analyzed by SLTC because a standard reference material is not readily available.

All sample results will be reported on Form OSHA 91B as  $\mu\text{g}/\text{m}^3$  and the severity calculation will use the PEL  $50 \mu\text{g}/\text{m}^3$  for silica, crystalline, and mixed respirable quartz and cristobalite.

Samples collected without a cyclone or at a sampling rate other than  $1.7 \pm 0.2 \text{ L}/\text{min}$  are considered non-respirable samples. These samples are analyzed and reported in the same manner as respirable samples; however, they are reported using IMIS codes S103 silica (quartz, total) or S105 silica (cristobalite, total). See link for OSHA sampling method information:

[https://www.osha.gov/dts/sltc/methods/inorganic/id142/id142\\_v4.html](https://www.osha.gov/dts/sltc/methods/inorganic/id142/id142_v4.html).

## **Cyclone Leak Test Procedure**

This section summarizes procedures for leak testing of the Dorr-Oliver cyclone samplers used for collecting respirable dust. Further details on this procedure are contained in the Cyclone Leak Test Procedure (CLTP), available through the OSHA Cincinnati Technical Center (CTC) (OSHA, 1997). [www.osha.gov/dts/ctc/cycloneleaktestprocedure/cycleak.html](http://www.osha.gov/dts/ctc/cycloneleaktestprocedure/cycleak.html). Compliance Safety and Health Officers (CSHOs) should review the entire leak test procedure before conducting the leak test as summarized below. The CLTP provides for more specific procedures for leak tests.

Note: If using the Cyclone Leak Test and Pump Calibration Kit offered by the CTC, use the quick reference cards included in the kit in combination with the CLTP procedure.

### **Nylon Part Inspection:**

- Disassemble the cyclone assembly, clean it, and inspect it for cracks and worn fit between parts. Take care not to scratch the inside surface of the cyclone chamber.
- Replace any worn or cracked units or parts.

### **O-Ring, Tubing, and Filter Leak Test:**

- Connect the entire cyclone assembly (minus the cyclone body) to the pressure gauge and aspirator, maintaining the normal spacing between the plastic filter adaptor (coupler) and the vortex finder.
- Seal the cyclone vortex finder opening by placing an airtight cap or your fingertip over the hole.
- Hold the cyclone assembly together with one hand.
- With your other hand, squeeze and gently release the aspirator bulb until the pressure gauge reads between 4" H<sub>2</sub>O and 10" H<sub>2</sub>O, then fold the tubing halfway between the "Tee" fitting and the aspirator. If the pressure reading is beyond full scale, release the vacuum and try again.
- Observe the pressure gauge reading for 30 seconds. If the pressure drops less than 25 percent, the leakage is acceptable and the unit passes the leak test. If the pressure drops more than 25 percent, corrective action is necessary. Sources of leaks include worn or damaged O-rings, cracked or ill-fitting tubing, and leaky pre-weighed filter cassettes.

**Note:** Leaks between the filter input and the air sampling pump are more disruptive than leaks at the plastic filter adaptor O-rings.

### **Final Pump-Fault Leak Test:**

- Connect the cyclone assembly to the pump in the normal sampling configuration with the air sampling pump running at 1.7 L/min.
- Close the inlet to the cyclone with tape or a finger. If the pump bears down and goes into a fault mode, the assembly passes this final, but crude, pump-fault leak test.

### **Reference:**

Occupational Safety and Health Administration (OSHA). Cyclone Leak Test Procedure. OSHA Cincinnati Technical Center. September 15, 1997.

## Appendix C

### **Sample Calculation of Time-Weighted Average (TWA) Exposures**

Both the PEL and the AL are expressed as 8-hour TWA exposures. TWA measurements account for variable exposure levels over the course of a work shift by averaging periods of higher and lower exposures. The TWA exposure for an 8-hour work shift is calculated using a simple formula:

$$\text{TWA} = (C_a T_a + C_b T_b \dots C_n T_n) \div 8$$

Where:

TWA is the time-weighted average exposure for the work shift

C is the concentration during any period of time (T) where the concentration remains constant; and T is the duration in hours of the exposure at the concentration (C).

For example, assume that an employee is exposed to respirable crystalline silica in an 8-hour workday as follows:

Two hours exposure at 100  $\mu\text{g}/\text{m}^3$

Two hours exposure at 50  $\mu\text{g}/\text{m}^3$

Four hours exposure at 10  $\mu\text{g}/\text{m}^3$

Enter this information in the formula:

$$(2 \times 100 + 2 \times 50 + 4 \times 10) \div 8 = 42.5 \mu\text{g}/\text{m}^3$$

Use the formula for Severity (SAE) and Upper/Lower Confidence Limits (UCL and LCL) in order to determine overexposure. ([OSHA Technical Manual-Silica](#))

## Appendix D

### **Silica Background Information and Additional References**

This appendix provides an overview of the following silica-related topics: the forms and sources of silica; common industrial uses of silica and workplaces with silica exposure; the history of silicosis; and health effects associated with exposure. The reference list at the end of this appendix provides many sources that may prove useful to those interested in a more in-depth treatment of these topics.

#### **Introduction:**

“Silica” is a term that refers broadly to the mineral compound silicon dioxide ( $\text{SiO}_2$ ). It can exist in either crystalline or amorphous states, but amorphous silica is not covered under the new Silica standards. Thus, the term “silica” as used in this document typically refers to crystalline silica.

Silica is a compound composed of the elements silicon and oxygen (chemical formula  $\text{SiO}_2$ ). Silica has a molecular weight of 60.08, and exists in crystalline and amorphous forms in the natural environment and during manufacturing or other processes. These substances are odorless solids, have no vapor pressure, and create non-explosive dusts when particles are suspended in air (U.S. EPA 1996).

Silica is classified as part of the “silicate” class of minerals, which includes compounds that are composed of silicon and oxygen and which may also be bonded to metal ions or their oxides. When they bond with metal and metal oxides (commonly of iron, magnesium, aluminum, sodium, potassium, and calcium), they form the silicate minerals commonly found in nature.

#### **Forms and Sources of Crystalline Silica:**

Crystalline silica occurs in three primary mineralogical forms, or polymorphs: quartz, cristobalite, and tridymite. Silica is also called “free silica,” to distinguish it from the silicates, which are minerals containing silicon dioxide bound to one or more cations [Beckett et al., 1997]. Quartz is by far the most common form of naturally occurring silica [Davis, 1996; IARC, 1997]. Cristobalite and tridymite, which are molecularly identical to quartz, are distinguishable by their unique crystalline structures. They are less stable than quartz, thus accounting for the dominance of the quartz form. Quartz itself exists as either of two sub-polymorphs: alpha-quartz (also known as low quartz), and beta-quartz (high quartz). Alpha-quartz is the thermodynamically stable form of crystalline silica and accounts for the overwhelming portion of naturally occurring crystalline silica [IARC, 1997].

Quartz is a major component of soils and is readily found in both sedimentary and igneous rocks, although the quartz content varies greatly from one rock type to another. For instance, granite contains on average about 30 percent quartz, and shales contain about 20 percent quartz. Natural stone, such as beach sand or sandstone, may be nearly pure quartz [IARC, 1997; Davis, 1996].

Cristobalite and tridymite are natural constituents of some volcanic rock, and man-made forms result from direct conversion of quartz or amorphous silica that has been subjected to high temperature or pressure. Diatomaceous earth, composed of amorphous silica, crystallizes during heating (calcining), yielding a calcined product that contains as much as 75 percent cristobalite. Cristobalite is also found in the superficial layers of refractory brick that has been repeatedly subjected to contact with molten metal [Markowitz and Rosner, 1995; Ganter, 1986; Cheng et al., 1992; Bergen et al., 1994].

#### Major Industrial Sources of Crystalline Silica Exposure:

Crystalline silica is an important industrial material, and occupational exposure occurs across a broad range of industries. There are over 30 major industries and operations where exposures to crystalline silica can occur. They include such diverse workplaces as foundries, dental laboratories, concrete products, and paint and coating manufacturing, as well as construction activities like masonry cutting, drilling, grinding and tuckpointing, and use of heavy equipment during demolition activities involving silica-containing materials.

Sand and gravel are used in road building and concrete construction. Sand with greater than 98% silica is used in the manufacture of glass and ceramics. Silica sand is used to form molds for metal castings in foundries, and in abrasive blasting operations. Silica is also used as a filler in plastics, rubber, and paint, and as an abrasive in soaps and scouring cleansers. Silica sand is used to filter impurities from municipal water and sewage treatment plants, and in hydraulic fracturing for oil and gas recovery (Document ID 1334, p. 11<sup>1</sup>). Silica is also used to manufacture artificial stone products used as bathroom and kitchen countertops, and the silica content in those products can exceed 85 percent (Document ID 2178, Attachment 5, p. 420).

The Final Rule's economic analysis has a listing of general industry, maritime, and construction North American Industry Classification System (NAICS) industries with potential for significant occupational exposure. However, there are numerous other operations in which silica may be used or otherwise encountered, and it is important to be aware of the risk of silicosis in industries not previously recognized to be at risk.

#### History of Silicosis:

Silicosis is one of the world's oldest known occupational diseases; reports of workers with the disease date back to ancient Greece. In 1938 the Department of Labor produced a film featuring then-Secretary of Labor Frances Perkins discussing the occurrence of silicosis among workers exposed to silica (see [https://www.osha.gov/dsg/topics/silicacrystalline/health\\_effects\\_silica.html](https://www.osha.gov/dsg/topics/silicacrystalline/health_effects_silica.html)). The health effects associated with silica exposure are well-established. There were numerous common names for the lung disease now known as silicosis. The names frequently referred to the affected laborers' trade, such as grinders' asthma, grinders' rot, masons' disease, miners' asthma, miners' phthisis, potters' rot, sewer disease, and stonemasons' disease.

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<sup>1</sup> Every submission to the docket for the respirable crystalline silica rulemaking was assigned a document identification (Document ID) number that consists of the docket number (OSHA-2010-0034) followed by an additional four-digit number. These submissions can be found at <http://www.regulations.gov>.

Despite its different names through the centuries, silicosis is a progressively disabling disease induced by the inflammatory effects of respirable crystalline silica in the lungs, which leads to lung damage and scarring and, in some cases, progresses to complications resulting in disability and death.

#### Adverse Health Effects of Crystalline Silica Exposure:

Silica exposure is associated with a number of health effects, including silicosis (a disabling and irreversible lung disease), other non-malignant respiratory diseases (such as chronic bronchitis, and emphysema), lung cancer, kidney disease, immunological effects, and activation of latent tuberculosis (TB) infections. Brief descriptions of some of these health effects are included below. For more information on silica-related health effects, see the preamble for the Final Rule for the Silica standards (81 FR at 16285, 16299 (3/25/2016)), plus the OSHA website's Safety and Health Topics page on Silica. See also, [NIOSH's webpage on Silica](#).

#### Silicosis:

Silicosis is an irreversible, progressive disease induced by the inflammatory effects of respirable crystalline silica in the lung, leading to lung damage, scarring, and, in some cases, complications resulting in disability and death. Exposure to respirable crystalline silica is the only known cause of silicosis. Three types of silicosis have been described: An acute form following intense exposure to respirable dust of high crystalline silica content for a relatively short period (*e.g.*, a few months or years); an accelerated form, resulting from about 5 to 15 years of heavy exposure to respirable dusts of high crystalline silica content; and, most commonly, a chronic form that typically follows less intense exposure of more than 20 years (Becklake, 1994, Document ID 0294, Balaan and Banks, 1992, 0289,). In both the accelerated and chronic forms of the disease, lung inflammation leads to the formation of excess connective tissue, or fibrosis, in the lung. Once established, the fibrotic process of chronic silicosis is thought to be irreversible (Becklake, 1994, Document ID 0294). There is no specific treatment for silicosis (Davis, 1996, Document ID 0998; Banks, 2005, Document ID 0291). Chronic silicosis is the most frequently observed type of silicosis in the U.S. today. Affected workers may have a dry chronic cough, sputum production, shortness of breath, and reduced pulmonary function.

#### Diagnosis:

The scarring caused by silicosis can be detected by chest X-ray or computerized tomography (CT) when the lesions become large enough to appear as visible opacities. The clinical diagnosis of silicosis has three requirements: Recognition by the physician that exposure to crystalline silica has occurred; the presence of chest radiographic abnormalities consistent with silicosis; the absence of other illnesses that could resemble silicosis on a chest radiograph (*e.g.*, pulmonary fungal infection or tuberculosis) (Balaan and Banks, 1992, Document ID 0289; Banks, 2005, Document ID 0291). A standardized system to classify opacities seen in chest radiographs was developed by the International Labour Organization (ILO) to describe the presence and severity of silicosis on the basis of size, shape, and density of opacities, which together indicate the extent severity and extent of lung involvement severity and extent of lung involvement



(ILO, 1980, Document ID 1063; ILO, 2002, 1064; ILO, 2011, 1475; Merchant and Schwartz, 1998, 1096; NIOSH, 2011, 1513.

#### Tuberculosis and Other Infections:

Silica exposed employees with latent TB are 3 to 30 times more likely to develop active pulmonary TB infection (ATS 1997; Rees and Murray 2007). Although respirable crystalline silica exposure does not cause TB infection, individuals with latent TB infection are at increased risk for activation of disease if they have higher levels of respirable crystalline silica exposure, greater profusion of radiographic abnormalities, or a diagnosis of silicosis. Demographic characteristics, such as immigration from some countries, are associated with increased rates of latent TB infection. PLHCPs can review the latest Centers for Disease Control and Prevention (CDC) information on TB incidence rates and high risk populations online (*see* Section 5 of Appendix B to the silica standard). Additionally, silica-exposed employees are at increased risk for contracting nontuberculous mycobacterial infections, including *Mycobacterium avium-intracellulare* and *Mycobacterium kansasii*.

#### Chronic Obstructive Pulmonary Disease:

Epidemiologic studies have shown that occupational exposure to respirable crystalline silica is associated with chronic obstructive pulmonary disease, including bronchitis and emphysema. The findings from some of these studies suggest that emphysema and bronchitis may occur less frequently or not at all in nonsmokers. Epidemiologic studies have also found significant increases in mortality from non-malignant respiratory disease—a category that includes silicosis, emphysema, and bronchitis—as well as some other related pulmonary diseases [NIOSH, 2002].

#### Lung Cancer:

OSHA concluded that exposure to respirable crystalline silica increases the risk for lung cancer among workers. The conclusion is based upon a comprehensive weight of evidence review of more than 60 epidemiological studies covering more than 30 occupational groups in over a dozen industrial sectors and the rulemaking record as a whole (81 FR at 16302). The strongest evidence for carcinogenicity came from studies in five industry sectors: diatomaceous earth workers, British pottery workers, Vermont granite workers, North American industrial sand workers, and British Coal Miners (81 FR at 16306-16307). OSHA's conclusion is consistent with classifications by the International Agency for Research on Cancer (IARC) and the National Toxicology Program (NTP). IARC (2012) concluded that "Crystalline silica in the form of quartz or cristobalite dust is carcinogenic to humans." In the Ninth Report on Carcinogens, NTP concluded that "respirable crystalline silica, primarily quartz dust occurring in industrial and occupational settings, is known to be a human carcinogen" (NTP 2016).

#### Autoimmune Diseases:

Several epidemiologic studies have found statistically significant increases in mortality from or cases of immunologic disorders and autoimmune diseases in employees exposed to silica. These disorders and diseases include scleroderma (a rare multisystem disorder characterized by

inflammatory, vascular, and fibrotic changes usually involving the skin, blood vessels, joints, and skeletal muscle), rheumatoid arthritis, systemic lupus erythematosus (lupus), and sarcoidosis (a rare multisystem granulomatous disease characterized by alterations in the immune system) [NIOSH, 2002].

#### Renal Disease:

In addition to a number of case reports, epidemiological studies have found statistically significant associations between occupational exposure to silica dust and chronic renal disease (Calvert *et al.*, 1997, Document ID 0976), subclinical renal changes (Ng *et al.*, 1992c, Document ID 0386), end-stage renal disease morbidity (Steenland *et al.*, 1990, Document ID 1125), chronic renal disease mortality (Steenland *et al.*, 2001b, Document ID 0456; 2002a, 0448), and granulomatosis with polyangitis (also known as Wegener's granulomatosis), a condition that can affect the kidneys (Nuyts *et al.*, 1995, Document ID 0397). In other findings, silica-exposed individuals, both with and without silicosis, had an increased prevalence of abnormal renal function (Hotz *et al.*, 1995, Document ID 0361), and renal effects have been reported to persist after cessation of silica exposure (Ng *et al.*, 1992c, Document ID 0386).

#### Summary:

As these health findings indicate, respirable crystalline silica exposure is associated with a number of diseases in addition to silicosis. Due to the lack of evidence of health hazards from dermal or oral exposure, OSHA focused solely on those studies associated with airborne exposure to Silica.

Silica exposure continues to pose substantial risks to employees, centuries after it was first identified as an occupational hazard. Reducing exposures to silica through engineering and work practice controls decreases the risk of developing silica-related diseases.

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## Appendix E

### Employee Questionnaire for use by CSHOs (Non-mandatory)

Note for CSHOs: This questionnaire, when completed, may be considered a medical record and must be used in accordance with § 1913.10 - *Rules Concerning OSHA Access to Employee Medical Records*. This questionnaire is intended to supplement guidance to [Section IX.J](#) of this Instruction when CSHOs are interviewing employees to evaluate the employer's medical surveillance program. CSHOs should consult with the OSHA Office of Occupational Medicine and Nursing (OOMN) regarding any findings of potential silicosis. The CSHO should also consult with the OOMN to determine whether there is a need for a medical access order.

Date: \_\_\_\_\_ Company Name: \_\_\_\_\_ Location: \_\_\_\_\_

#### A. Personal Information

Employee's Name: \_\_\_\_\_ Gender: ☐ Male ☐ Female  
Current Job Title: \_\_\_\_\_ Age: \_\_\_\_\_

#### B. Job-Related Information

Number of hours worked in silica-related tasks per week: \_\_\_\_\_ List previous jobs and duration of each job:

- |  |                      |
|--|----------------------|
| <input type="checkbox"/> 10-20                       | a. _____ (____ yrs.) |
| <input type="checkbox"/> 20-30                       | b. _____ (____ yrs.) |
| <input type="checkbox"/> 30-40                       | c. _____ (____ yrs.) |
| <input type="checkbox"/> More than 40 ( _____ hours) | d. _____ (____ yrs.) |

Time at current job:

- ☐ Six months or less  
☐ 1-2 yrs  
☐ 3-5 yrs  
☐ More than 5 yrs. ( \_\_\_\_\_ yrs.)

How many days per year do you work in a silica-related task? \_\_\_\_\_ days.

How many days per year do you need to wear a respirator due to work in a silica-related task? \_\_\_\_\_ days.

#### C. Brief Medical History

Are you being treated by a physician for breathing problems? ☐ Yes ☐ No

Have you ever had a chest X-ray? ☐ Yes ☐ No

If yes, when was your last chest X-ray? \_\_\_\_\_

Why was the chest X-ray taken? \_\_\_\_\_

Did the doctor tell you everything was normal? ☐ Yes ☐ No

If no, what was noted? \_\_\_\_\_

What treatment are you receiving for this problem? \_\_\_\_\_

Have you discussed your medical history with your employer? ☐ Yes ☐ No

Are you a cigarette smoker? ☐ Yes ☐ No

## Appendix F

### CSHO Checklists for Respirable Crystalline Silica Inspections

These non-mandatory checklists are intended to be a quick reference tool for a Compliance Safety and Health Officer (CSHO) conducting silica-related inspections.

#### Construction Checklist

##### Table 1 - Specified Exposure Control

##### Methods

- ☐ Equipment/task identified
- ☐ Controls fully and properly implemented; if not, collect air sample
- ☐ Manufacturers' instructions followed
- ☐ Water spray at point of dust generation at sufficient flow rates
- ☐ Adequate supply of water is on site
- ☐ Dust collectors commercially available and meet reqd. CFM and 99% filter efficiency
- ☐ Means of exhaust for tasks indoors/in enclosed areas
- ☐ Enclosed cab doors sealed properly
- ☐ All engaged workers wearing specified respirators, APF of 10 or 25, if required
- ☐ Do multiple tasks add to > 4 hours?  
If yes, is the required respiratory protection used, if any?

[Or]

##### Alternative Exposure Control Methods

- ☐ Exposures correctly assessed
- ☐ Performance option w/ monitoring or objective data (under conditions closely resembling or higher exposure potential), before work begins
- ☐ Scheduled monitoring option represents each job, work area and shift, as soon as work begins
  - ☐ New or additional exposures reassessed
- ☐ Employees notified of results within 5 working days
- ☐ Sample analysis compliant w/ Appendix A
- ☐ Feasible engineering controls and work practices used; respirators if needed
- ☐ Abrasive blasting also complies with 29 CFR § 1926.57

(cont.)

#### General Industry / Maritime Checklist

##### Exposure Assessment

- ☐ Exposures correctly assessed
- ☐ Performance option w/ monitoring or objective data (under conditions closely resembling or higher exposure potential), before work begins
- ☐ Scheduled monitoring option represents each job, work area and shift, as soon as work begins
- ☐ New or additional exposures reassessed
- ☐ Employees notified of results within 15 working days
- ☐ Sample analysis compliant w/Appendix A

##### Regulated Areas

- ☐ Reasonably expected to exceed PEL
- ☐ Demarcated; signs at entrance
- ☐ Access limited; respirators provided

##### Methods of Compliance

- ☐ Feasible engineering controls and work practices used; respirators if needed
- ☐ Abrasive blasting also complies with 29 CFR §§ 1910.94, 1915.34, 1915 Subpart I, as applicable

##### Hydraulic Fracturing

- ☐ Type and source of proppant
- ☐ Compliant with all provisions by 6/23/2018, except as follows:
  - ☐ Engineering controls implemented by 6/23/2021

##### Medical Surveillance

- ☐ Medical surveillance for employees 30 days a year at or above AL (began 6/23/2020)

(cont.)

**Construction Checklist (cont.)**

**Communication of Hazards**

- ☐ Includes silica in HAZCOM program
- ☐ Employees knowledgeable of standard, health hazards, workplace exposures, protective measures, medical surveillance
- ☐ Copy of standard available at no cost
- ☐ Employees identified competent person

**Recordkeeping**

- ☐ All air monitoring and objective data
- ☐ Info provided to PLHCPs and specialists
- ☐ PLHCPs' and specialists' medical opinions
- ☐ Maintained and available per 29 CFR § 1910.1020

**Gen. Industry / Maritime Checklist (cont.)**

**Communication of Hazards**

- ☐ Includes silica in HAZCOM program
- ☐ Employees knowledgeable of standard, health hazards, workplace exposures, protective measures, medical surveillance
- ☐ Copy of standard available at no cost
- ☐ Correct signage at regulated areas

**Recordkeeping**

- ☐ All air monitoring and objective data
- ☐ Info provided to PLHCPs and specialists
- ☐ PLHCPs' and specialists' medical opinions
- ☐ Maintained and available per 29 CFR § 1910.1020

## Appendix G

### Hydraulic Fracturing Background

- A. Background: Hydraulic fracturing or “fracking” is a process used to stimulate well production in the oil and gas industry. It is not a new process, but its use has increased significantly because of new horizontal drilling and multi-stage fracking (or “completions”) technologies that improve access to natural gas and oil deposits. It involves pumping large volumes of water and sand into a well at high pressure to fracture shale and other tight formations, allowing oil and gas to flow into the well. Silica sand used as a proppant contains a high percentage of crystalline silica, typically ranging from 60 to 100 percent depending on the source. When silica sand is used as a proppant in hydraulic fracturing, high airborne concentrations of respirable silica dust can occur as workers deliver, convey, and mix large volumes of sand with fracturing fluid.

The following locations or equipment are the primary sources of dust emissions on fracturing worksites:

1. Dust emitted from thief hatches (open ports on the top of the sand movers used to allow access into the bin);
  2. Dust ejected and pulsed through side fill ports on the sand movers during refilling operations;
  3. Dust released from:
    - a. transfer belt under the sand movers;
    - b. operations of transfer belts between the sand mover and the blender;
    - c. top of the dragon’s tail (end of the sand transfer belt) on sand movers;
  4. Dust created as sand drops into, or is agitated in, the blender hopper and on transfer belts;
  5. Dust generated by on-site vehicle traffic, including sand trucks and crew trucks, by the release of air brakes on sand trucks, and by winds.
- See Technical Feasibility document ([Chapter 4.22, Hydraulic Fracturing](#)), for further information.

- B. Fracturing Inspection Guidelines: CSHOs should review the employer’s records and/or interview the employer and employees to determine the following:

**Note:** The inspection procedures that are outlined in Section IX of this Instruction apply to fracturing inspections.

1. Type and Source of Proppant:

Determine the following regarding the proppant being used:

- a. Silica content (from safety data sheet, if available).
- b. Quantity of proppant (per day, per shift, or per job task).
- c. Possible heavy metal contamination.
- d. Proppant particle size.
- e. Make-up of the proppant solution.

Proppant consists of particles that hold open the fractures created by hydraulic fracturing, allowing the oil and gas to flow out of the formation and into the well bore. Silica sand is frequently used as a proppant. Other proppants can include sintered bauxite or ceramics, and resin-coated sand.

- 2. Exposure Assessment: Review the employer's silica exposure assessment for compliance with 29 CFR § 1910.1053(d)(1). Assess the following:
  - a. Tasks/operations that are likely to exceed the AL and/or the PEL.
  - b. Employer exposure reassessments.
  - c. Appropriate method of sampling analysis.
  - d. Regulated area included "at risk" tasks/operations.
  - e. Employee notification of the results from the exposure assessment.
  - f. Date of employee notification.
- 3. Regulated Areas: Evaluate the employer's regulated area to ensure that it meets the following requirements of 29 CFR § 1910.1053(e)(2) and (e)(3):
  - a. Effective demarcation and signage with appropriate warning language.
  - b. Effective protocol to limit access into the regulated area.
  - c. Designated authorized personnel.
- 4. Engineering Controls: Evaluate what types of engineering controls are being used to limit employees' exposure following 29 CFR § 1910.1053(f)(1).

**Note:** Employers have until June 23, 2021, to be in compliance with this paragraph. The CSHO should collect the following information regarding the controls:

- a. Local Exhaust Ventilation Unit:
  - Make, model, and rated air moving capacity (CFM) at a given static pressure.
  - Diameter and length of ductwork.
  - Proppant transport velocity (FPM) inside the duct (goal is 3,500 FPM).
  - Design and actual static pressure drop across the filter for the ventilation system (inches of water).
  - Filtration efficiency (e.g., HEPA filter); location of system exhaust.
  - Method of disposal of captured proppant.
- b. Proppant Loading and Moving Equipment:
  - Equipment staging plan with operational parameters.
  - Type of proppant loading equipment (gravity vs. pneumatic feed).



- Pneumatic loading parameters of proppant to sand movers—feed rate and feed pressure (PSI).
  - Methods and effectiveness of dust controls at conveyor belt transfer points.
  - Excessive proppant conveyor feed rates causing spillage.
  - Locations of work stations.
- c. Mobile Equipment, Change Trailers and Work Trailers:
- Efficiency of HVAC filtration system—standard HVAC filters are coarse and not designed to remove respirable particulate.
5. Administrative Work Practices: Evaluate administrative controls that are being used by the employer to limit employees' exposure. Administrative controls could include, for example:
- a. Minimizing accumulation inside changing trailers, work trailers, and cabs of mobile equipment.
  - b. Restricting workers not engaged in a silica task from accessing or continually standing and working close to silica dust sources.
  - c. Ensuring proper doffing of contaminated personal protective equipment (e.g., coveralls).
6. Equipment Maintenance Program: Proper equipment maintenance will greatly reduce sources of dust emissions. CSHOs should check for:
- a. Cap and cover all unused ports and hoses on proppant handling and moving equipment.
  - b. Repair holes worn in equipment due to sand abrasion.
  - c. Ensure that all enclosures used for dust control are in good condition and are not leaking.
  - d. Ensure that the fall distance between conveyor transfer points and hoppers is kept to a minimum.
  - e. Ensure that all exhaust ventilation ducts are in good condition.
  - f. Ensure that the exhaust ventilation unit is operating as designed and within the appropriate static pressure range.
  - g. Ensure that the final filter and seals on the exhaust ventilation system are in good condition.

Ensure that the environmental cabs for mobile equipment are properly maintained (door seals, HVAC system, windows, condition of cab door).

**Note:** The silica standards do not prohibit the rotation of employees (a type of administrative control) to limit employee exposures. However, this practice is discouraged as a means of avoiding implementation of engineering and other work practice controls, due to potential difficulty maintaining employees' exposures at/or below the PEL solely using rotation. Moreover, the use of

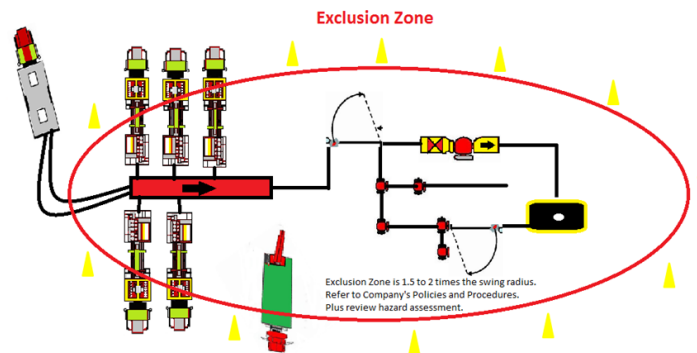
rotation may require the employer to provide medical surveillance to additional workers and to train many workers on multiple jobs (see [GI FAQ # 30](#)).

7. *Fugitive Dust Controls*: Evaluate measures taken by the employer to control fugitive dust from the drill pad and roadways. Examples:
  - a. Use of water and surfactants.
  - b. Frequency of application.
8. *Written Exposure Control Plan*: Review the employer's exposure control plan to ensure that it contains the minimum requirements as outlined in 29 CFR § 1910.1053(f)(2):
  - a. Description of the tasks that involve silica exposure.
  - b. Description of engineering controls, work practices, and respiratory protection.
  - c. Description of housekeeping measures.
  - d. Annual review of exposure control plan.
  - e. Availability of written ECP to covered employees.
9. *Respiratory Protection Program*: Evaluate the employer's respiratory protection program and its implementation in accordance with 29 CFR § 1910.134.
  - a. Selected respirator is used within its assigned protection factor.
  - b. Respirator cartridge efficiency requirements (P-100, HEPA filtration).
  - c. Medical evaluation and fit testing.
  - d. Proper use and maintenance of respiratory protection.
10. *Housekeeping and Work Practices*: Evaluate whether the employer allows:
  - a. Use of compressed air to remove dust from clothing.
  - b. Dry sweeping that contributes to worker exposures.

C. General:

1. *Observations*:
  - a. Document the silica-related activities observed while on site.
  - b. Dust sources and their specific cause.
  - c. Effectiveness of engineering controls.
  - d. Employee work practices and personal protective equipment (PPE).
  - e. Location of regulated area and the exclusion (red) zone.
  - f. Enforcement of the regulated and the exclusion zones.
  - g. Weather conditions.
  - h. Size of well pad.

**Note:** Know and follow the employer's exclusion zone (red zone) (example below) for the hydraulic fracturing site, which allows only essential workers within the specified zone. The exclusion zone contains pressurized pipes and related equipment that present potential struck-by hazards if a connection failure were to occur during fracturing operations. The exclusion zone **does not** necessarily equate to the silica regulated area. **Do not** enter the exclusion zone during fracturing operations. The exclusion zone can be 1.5 to 2 times (or company's policy) the swing radius of a length of pipe. The exclusion zone should have demarcation, signage, barriers, restrictions, or other methods to control access. CSHOs should refer to the company's policies and procedures and review the company's hazard assessment prior to site entry.



2. Third Party Contractors: Document third-party contractors who provide hydraulic fracturing services at the well site.
  - a. Dust control and disposal services
  - b. Proppant suppliers
  - c. Equipment maintenance (including maintenance performed at off-site locations).

D. CSHO Personal Protective Equipment:

1. CSHOs assigned to conduct silica monitoring at hydraulic fracturing sites **must** be approved to wear at least an air-purifying half-mask respirator equipped with P-100 cartridges. The CSHO must have passed a medical evaluation/respirator fit test within the previous year.
2. Other required personal protective equipment is fire-retardant (FR) clothing, including a FR high visibility vest; hard hat, eye and foot protection.

E. CSHO Equipment:

1. CSHOs should be equipped with a multi-gas meter for oxygen, LEL, carbon monoxide, and hydrogen sulfide. If your multi-gas meter does not test for

hydrogen sulfide, then the CSHO will need a hydrogen sulfide air monitor.

2. CSHOs should also refer to OSHA Publication 3763, *Hydraulic Fracturing and Flowback Hazards Other than Respirable Silica Guide*, for more information about hydraulic fracturing and flowback operations hazards. The guide can be found at <https://www.osha.gov/Publications/OSHA3763.pdf>.

## Appendix H

### **Additional Guidance and Resources**

CSHOs may find useful additional guidance and resources available from CPWR - The Center for Construction Research and Training (CPWR). The CPWR information can be found at <https://www.silica-safe.org/>. In particular, alternate names of tools and equipment can be found in the CPWR's [Training and Other Resources](#) webpage.