

Silica and the Material Testing Laboratory

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Objectives

- Review OSHA Respirable Crystalline Silica Rule
- Strategy For Success - Materials Testing Laboratory Silica Example
 1. Identify High Risk Silica Exposures
 2. Minimize or Eliminate Silica Exposures
 3. Monitor Silica Exposures
 4. Continuously Drive Exposures Down

OSHA Respirable Crystalline Silica Rule

- Purpose of the rule is to curb lung cancer, silicosis, chronic obstructive pulmonary disease and kidney disease.
- Permissible Exposure Limit (PEL) reduced to 50 ug/m³ with an action level of 25 ug/m³ (8-hour time weighted average).
- Provides medical exams to monitor highly exposed workers.
- Provides two options for compliance:
 - Follow Table 1 Control Methods
 - Assess and limit exposure for Table 1 or tasks not listed

OSHA Respirable Crystalline Silica Rule, Continued

Monitoring Requirements

- For initial employee monitoring results:
 - $<25 \text{ ug/m}^3$ – monitoring can be discontinued
 - $>25 \text{ ug/m}^3$ and $<50 \text{ ug/m}^3$ – repeat monitoring in 6 months
 - $>50 \text{ ug/m}^3$ – repeat monitoring in 3 months
- Employers may discontinue monitoring when two consecutive measurements other than the initial assessment are below 25 ug/m^3 (taken seven days apart).

OSHA Respirable Crystalline Silica Rule, Continued

Rule Effective Dates

- ***Construction*** - June 23, 2017, one year after the effective date.
- ***General Industry and Maritime*** - June 23, 2018, two years after the effective date.
- ***Hydraulic Fracturing*** - June 23, 2018, two years after the effective date for all provisions except Engineering Controls, which have a compliance date of June 23, 2021.

1. Identify High Risk Silica Exposures

Potentially Exposed Groups

- Construction materials technicians – field
- Construction materials technicians – laboratory
- Anyone visiting or working at project sites involving intrusive tasks – drilling, excavation, demolition, or construction.
- This discussion is focused on the materials laboratories but is applicable to anyone potentially exposed to respirable silica.
- The strategy is to control or avoid dust.

1. Identify High Risk Silica Exposures

Methodology: Materials Testing Labs

- Identified unique material tests completed in each laboratory
- Determined the number of tests completed annually
- Risk-based approach – focused on exposure:
 - How often tests are completed;
 - Test duration; and
 - Tests with high probability of risk (those with noise, dust, or chemicals).



1. Identify High Risk Silica Exposures

Low-Medium	Medium-High	High
Handling samples (e.g. opening sample bags)	Mechanically:	Use of compressed air for removing dust.
Manually sieving samples	- Cutting rock, concrete, brick or tiles	THIS ACTIVITY IS PROHIBITED
Manually splitting samples*	- Coring rock or concrete	
Charging mixers with silica containing materials*	- Polishing or grinding rock, concrete, brick or tiles	
	- Sieving samples (Gilson)	
	- Crushing	
	Dry sweeping dust. THIS ACTIVITY IS PROHIBITED	

* levels vary based on % silica and activity frequency.

2. Minimize or Eliminate Silica Exposures

Engineering Controls

Wet Methods are used for:

- Polishing and grinding wheels
- Cutting concrete using a wet saw
- Diamond-bit coring using water
- Splitting or handling wetted samples



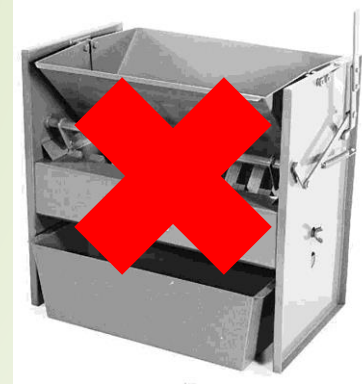
Wet methods must be applied when possible.

2. Minimize or Eliminate Silica Exposures

Engineering Controls

Equipment Enclosure:

- The Gilson SP-10 splitter is an adaptation of the SP-1 splitter, but designed to control the dust (enclosed).
- Upgrade equipment when activity occurs at a high frequency and cannot be wetted or controlled by ventilation.



**Not Enclosed
Dusty**



**Completely
Enclosed -
Not
Dusty**

2. Minimize or Eliminate Silica Exposures

Engineering Controls

Process Isolation:



Provide enclosures with doors for equipment.



Use of plastic sheeting for universal splitters.

2. Minimize or Eliminate Silica Exposures

Engineering Controls

- **Mechanical crushers are capable of generating significant levels of airborne silica dust.**
- Each requires an evaluation and specific engineered dust controls including isolation and local exhaust ventilation (LEV) by a qualified person.



2. Minimize or Eliminate Silica Exposures

Engineering Controls

Local Exhaust Ventilation (LEV)

- LEV can reduce respirable dust 5-20 times
 - HEPA Vacuum with bag
 - Knock-out drum removes bulk material using cyclone
- Provides negative air pressure to enclosures



2. Minimize or Eliminate Silica Exposures

Work Practices

Dry sweeping and use of compressed air is strictly prohibited!



Both these activities can stir up large amounts of dust.

2. Minimize or Eliminate Silica Exposures

Work Practices

Work practices apply to dusty surfaces, equipment, and work areas.

- Housekeeping procedures must include:
 - Frequent sweeping using approved dust-suppression compound (floor sweep)
 - Wet-wipe surfaces, and/or
 - Use a vacuum equipped with a HEPA filter and bag for disposal.
- Containers of silica-containing material should be kept tightly closed.



2. Minimize or Eliminate Silica Exposures

Work Practices

The following hygiene work practices should be applied:

- No smoking (tobacco or water vapor), eating, drinking or chewing in work areas.
- Wash facilities for use at the end of each shift.
- Remove excess dust from clothing at entrances to work area using HEPA vacuum or effective technology.
- Supplied work clothing/lab coats with appropriate laundering procedures for silica impacted laundry.



2. Minimize or Eliminate Silica Exposures

Personal Protective Equipment (PPE)

- PPE is the last line of defense.
 - Eye protection
 - Work Clothing
 - Foot protection
 - Respirators, as required.
- Respiratory protection is not an acceptable long-term solution.
- Engineered controls are intended to reduce the generation of airborne dust to within acceptable levels.



2. Minimize or Eliminate Silica Exposures

Respirator Protection

Silica Respirator Program

Disposable Respirators

May 2015



SILICA HAZARD

**DO NOT EAT
DRINK OR SMOKE
IN THIS AREA**

DANGER

SILICA DUST

**WET WIPING, HEPA VACUUM ONLY
COMPRESSED AIR / DRY
SWEEPING PROHIBITED**

2. Minimize or Eliminate Silica Exposures

Respirator Protection

Silica Respirator Program

- What will we cover?
 - ✓ Step 1: Should you wear a respirator?
 - ✓ Step 2: Medical Pre-screening Questionnaire
 - ✓ Step 3: Training
 - ✓ Step 4: Issue Approved Respirators
 - ✓ Step 5: Respirator Fit Testing



3. Monitor Silica Exposures

- An industrial hygiene study was conducted at two major material testing laboratories in 2010.
- The study had the following outcomes:
 - Established a methodology to use at other locations.
 - Determined regulatory status.
 - Assessed employee occupational exposures to noise, dust (silica) and airborne chemicals.



3. Monitor Silica Exposures

- Periodic testing for airborne respirable silica has occurred at various materials testing Labs over 6 years, including area and personal exposure monitoring.
- Silica monitored using NIOSH Method 600/7500: [Video of Method](#) and [Calibration](#).
- Real-time monitoring using a DustTrak found good housekeeping reduced total dust by at least a factor of 10.
- Results in the US have demonstrated detectable levels of silica, below past and current exposure limits.
- Additional airborne silica exposure monitoring program is ongoing.



4. Continuous Improvement

- At field project sites not under our control – avoid dust and contact HSE department for respiratory protection
- At field project sites under our control and at our labs:
 - Apply wet methods and utilize wet housekeeping.
 - Compressed air is prohibited for housekeeping.
 - Enclose/isolate/ventilate the technological process generating dust (consider purchasing an enclosed splitter).
 - Conduct occupational exposure monitoring to assess current conditions.
 - Encourage feedback from workers of additional activities with potential exposure to airborne respirable silica.

4. Continuous Improvement

Recognize each task that generates visible dust, re-evaluate it and apply controls:

1. **Substitute** equipment or methods to reduce/eliminate dust.
2. Where it is not possible to substitute or eliminate these activities, re-locate these activities to an area that is separate from other activities that are not dust generating.
3. Apply **Process Controls**, specifically **Wet Methods** for cutting, grinding and coring operations.
4. Apply **Isolation methods** by providing enclosures for equipment or tests where possible and apply practices to allow dust to settle before opening them.
5. Apply **Ventilation Controls** to reduce a silica hazard at its source, where possible and necessary due to high frequency of testing, by providing negative air pressure using Local Exhaust Ventilation, equipped with High Efficiency Particulate Air (HEPA) filters.

Strategy For Success

1. Identify High Risk Silica Exposures
2. Minimize or Eliminate Exposures Using Best Practices
3. Monitor Silica Exposures
4. Continuously Drive Exposures Down

QUESTIONS?

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