AIHA Pittsburgh Section

OSHA's New Silica Standards

Del Kubeldis, CIH, CSP, ARM
Director of Field Operations

Amerisafe Group

Objectives

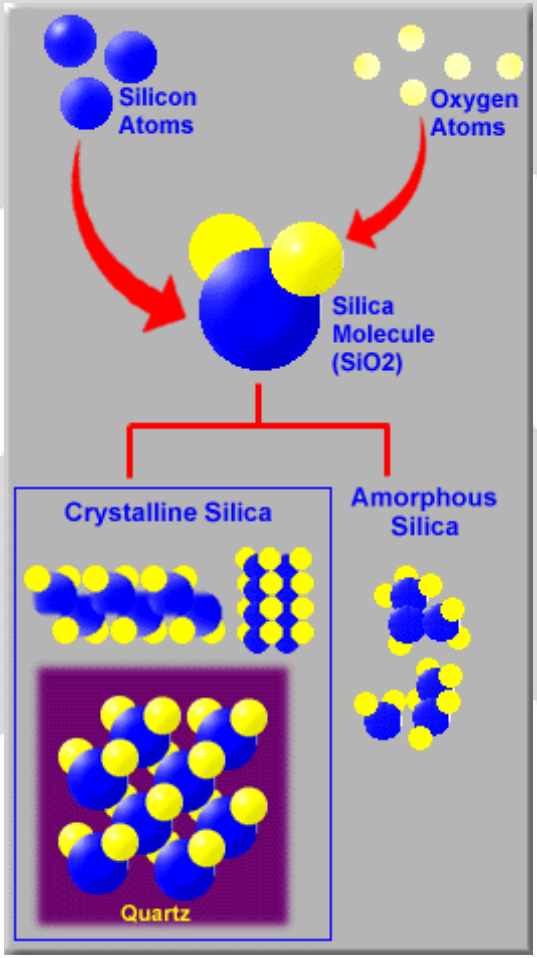
- Briefly review health hazards associated with Silica exposure
- Review the OSHA Respirable Crystalline Silica Standard for Construction (29 CFR 1926.1153) and General Industry (29 CFR 1910.1053)
- Discuss significant differences between the Standards

Review of Health Hazards

What is Silica?

"Silica" - refers to silicon dioxide

- **Exists in crystalline or amorphous forms**
- **Crystalline silica**
  - **more hazardous**
  - **occurs as quartz, cristobalite or tridymite**



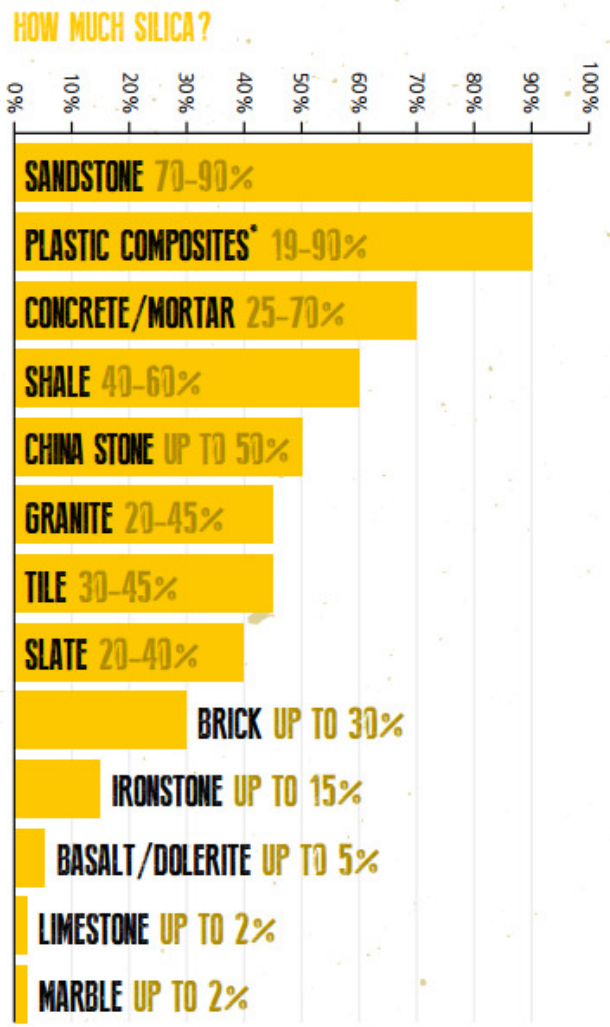
Where is Silica Found?

Naturally Occurring

Quartz – 2nd most common mineral in earth's crust

Manufactured products:

- Concrete products
- Bricks and blocks
- Common construction materials



Silicosis

One of oldest known occupational diseases…

- Reports date to ancient Egypt and Greece
- Recognized in knife grinders and potters in the 18th century
- Later known by associated trade as “grinders’ asthma”, “masons’ disease” and “miners’ phthisis”

All Silicosis!

2,000 yr. old quarry

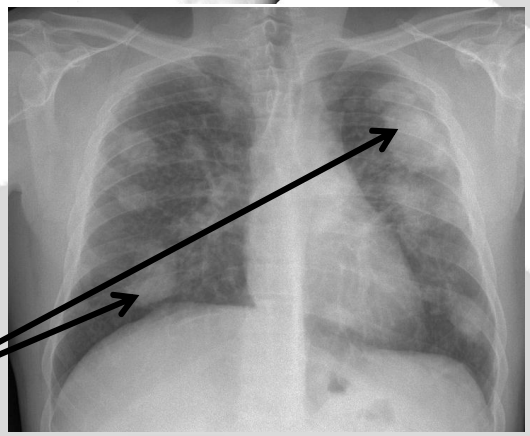
Ancient pottery makers

Silicosis

Symptoms

- Dry, non-productive cough
- Initial breathlessness during exercise, which progresses to shortness of breath during normal activity
- Progresses to lung scarring and failure

Healthy Lung



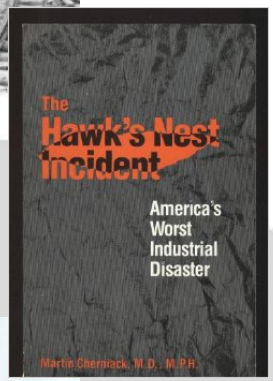
Scarred Lung

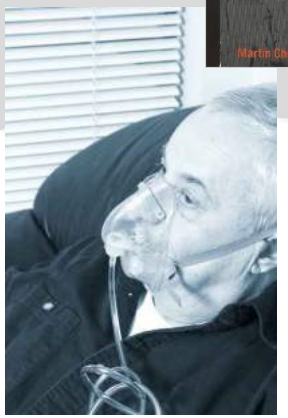
Diagnosis

- Incurable
- Causes significant impairment or death

Silicosis

- **Acute silicosis** (1-3 yrs.)
- **Accelerated silicosis** (3-10 yrs.)
  - 36-yr old, sandblasted for 36 months, died 11 yrs. after exposure
  - 30-yr old, sandblasted for 48 months, died 10 yrs. after exposure
- **Chronic silicosis** (20-25 yrs.)



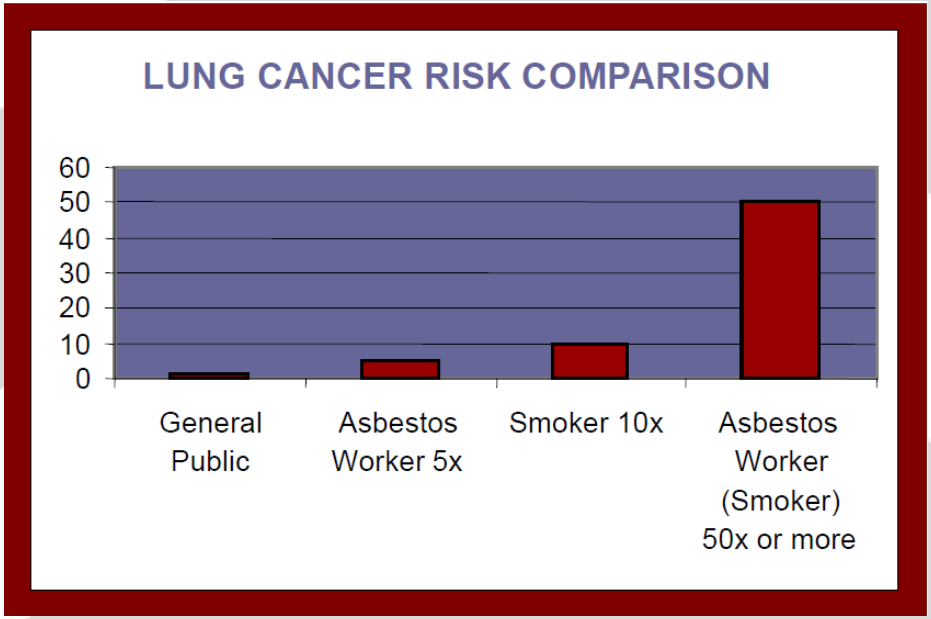


Silicosis is a single disease w/single cause – breathing crystalline silica dust

Other Health Hazards of Silica

Occupational Carcinogen

- IARC Group 1 for lung cancer
- "Known Human Carcinogen"
- Same as benzene, asbestos and vinyl chloride
- Some evidence of "synergy" w/cigarette smoking similar to asbestos exposure

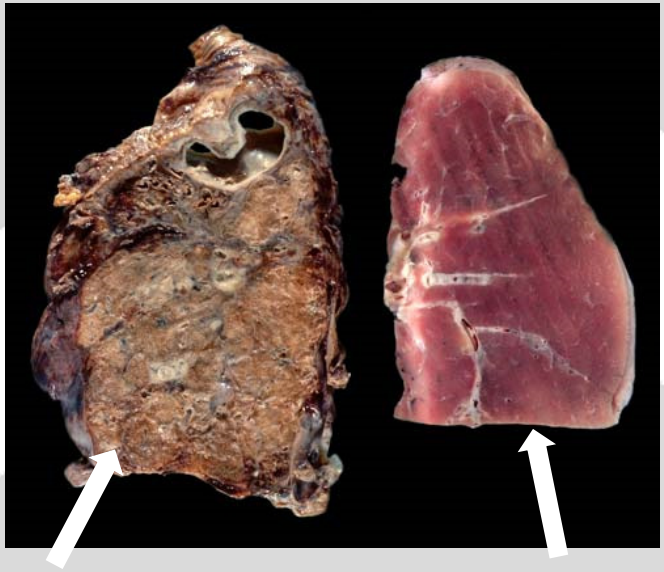


Asbestos Synergistic Effect

Other Health Hazards of Silica

Also linked with:

- Tuberculosis, emphysema, and pneumonia
- Stomach and other cancers
- Chronic renal (kidney) disease



Lung with Silicosis and Tuberculosis

Healthy Lung

Silica Exposures – Where?

General Industry
- Foundries
- Manufacturing

Construction
- Building Trades
- Heavy/Highway

Oil/Gas
- Fracking

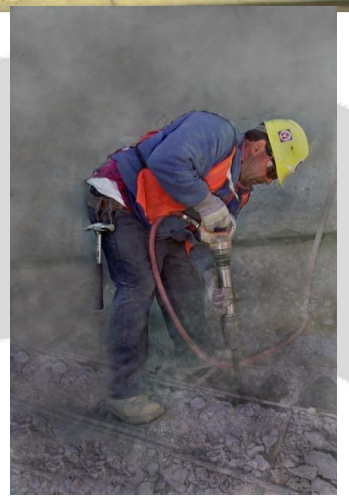
Mining
- Rock crushing

OSHA estimates 2.3 M workers exposed to Silica – 2.0 M in Construction

Silica Exposures - Construction

Some operations/tasks with exposure:

- Abrasive/sand blasting (High Risk)
- Stone, brick, and concrete block cutting, blasting, chipping, grinding, and sawing
- Cement/concrete mixing or cutting
- Demolition
- Jackhammer operations
- Milling and crushing operations

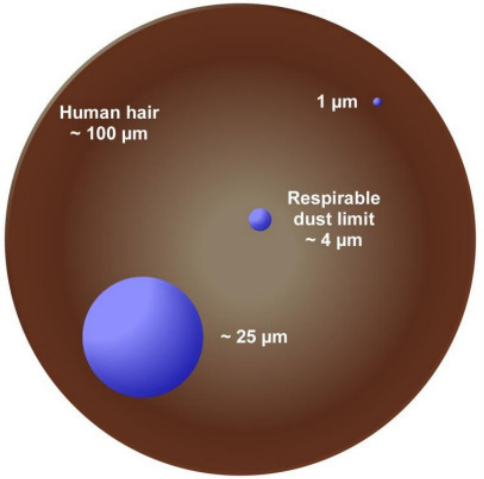


OSHA's Silica Standards

"Occupational Exposure to Respirable Crystalline Silica" standards (1926.1153 and 1910.1053) - published in FR 3/24/16

Why Needed Per OSHA?

- **Current PELs adopted in 1971 and not protective of workers**
- **Since 1971 NTP, IARC, and NIOSH identified Silica as human carcinogen**



Overview of OSHA Construction Standard

OSHA's "Respirable Crystalline Silica (RCS)" Standard

Similar in format to other Health Standards…

a) Scope/Application
b) Definitions
c) Specified Exposure Control Methods (a.k.a., "Table 1")
d) Alternative Exposure Controls Methods
e) Respiratory Protection
f) Housekeeping
g) Written Exposure Control Plan
h) Medical Surveillance
i) Communication of silica hazards to employees
j) Recordkeeping
k) Dates

a) Scope/Application

The standard applies to…

- "…all occupational exposures to RCS in construction work…"
- Std. does NOT apply if worker exposure < Action Level (AL) "under any foreseeable conditions"
- AL = 25 µg/m^3 as 8-hour Time-Weighted Average (TWA)
  - Tuckpointing?
  - Saw-cutting concrete?
  - Equipment Operator?
  - Superintendent?

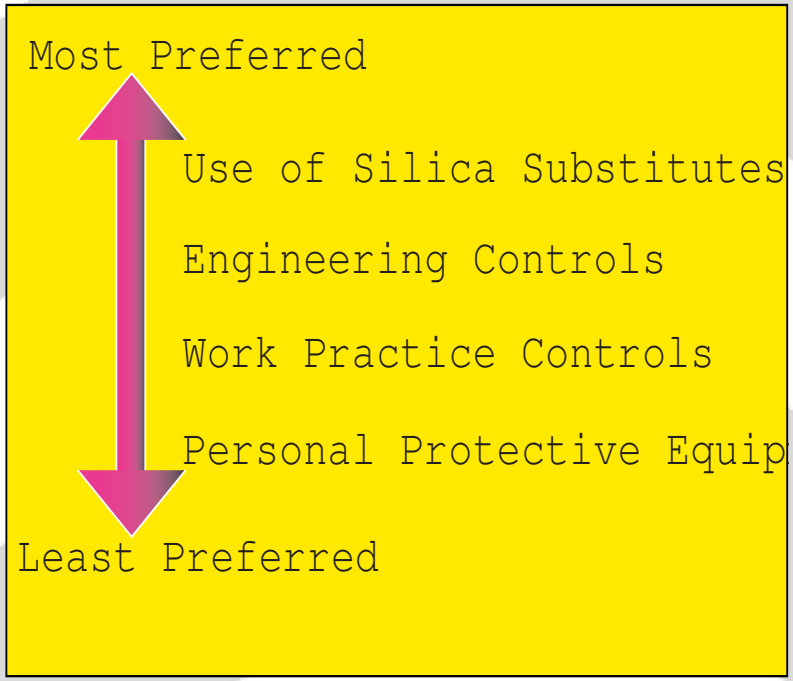
b) Definitions

- **Competent Person** – "an individual who is capable of identifying existing and foreseeable RCS hazards **and** who has authorization to take prompt corrective measures to eliminate or minimize them"

- **Objective data** – "information, such as industry-wide surveys or calculations…the data must reflect workplace conditions closely resembling or w/higher exposure"

c) Specified Exposure Control Methods

- OSHA established Table 1 (18 Tasks)
- Table 1 based on "Hierarchy of Controls" to force employers to use Engineering and Work Practice controls



c) Specified Exposure Control Methods(Table 1)

If following Table 1, some requirements eliminated

	Must the Employer Follow this Requirement?	
Requirement	**If Fully and Properly Implementing Table 1**	**If Following Alternative Exposure Controls**
PEL	**No**	**Yes**
Exposure Assessment	**No**	**Yes**, when exposures are reasonably expected to be above the action level.
Methods of Compliance	**No**	**Yes**
Respiratory Protection	**Yes**, if respirator use is required by Table 1	**Yes**, if respirator use is required to reduce exposures to the PEL
Housekeeping	**Yes**	**Yes**
Written Exposure Control Plan	**Yes**	**Yes**
Medical surveillance	**Yes**, for employees who must wear a respirator under the silica standard for 30 or more days a year.	
Communication of Hazards	**Yes**	**Yes**
Recordkeeping	**Yes**, for any employees who are getting medical examinations	**Yes**, for exposure assessments and for any employees who are getting medical examinations

Table 1 - Task 1 Stationary Masonry Saw

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(i) Stationary masonry saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None

Without water control

With water control

Table 1 - Stationary Masonry Saw (and any Task where water is used)

- "Full and proper implementation" of water controls requires the employer ensure:

1. Control was commercially developed specifically for the type of tool in use
2. An adequate supply of water for dust suppression is used
3. The spray nozzle is working properly to apply water at point of dust generation
4. The spray nozzle is not clogged or damaged
5. All hoses and connections are intact

- If cutting indoors ("structure w/roof and 3 walls") additional ventilation needed

Table 1 - Task 2 Handheld Power Saw

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(ii) Handheld power saws (any blade diameter)	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. ▪ When used outdoors. ▪ When used indoors or in an enclosed area.	None APF 10	  (Half mask required) APF 10 APF 10

Without water control

With water control

= Half Mask/Filtering Facepiece Required

Table 1 - Task 3 Handheld Power Saw (for cutting fiber-cement board)

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)	For tasks performed outdoors only: ▪ Use saw equipped with commercially available dust collection system. ▪ Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. ▪ Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency.	None	None

Without LEV

With LEV

Table 1 - Handheld Power Saw (for cutting fiber-cement board and Tasks using collection system)

"Full and proper implementation" of dust collection system requires employer ensure:

1. Control is commercially available dust collection system with filter having ≥99% efficiency;
2. Shroud or cowling is intact and installed according to manufacturer's instructions;
3. Hose connecting tool to the vacuum is intact and without kinks or tight bends;
4. Filter(s) on the vacuum are cleaned or changed in accordance with manufacturer's instructions to prevent clogging; and
5. The dust collection bags are emptied to avoid overfilling.

Without LEV

With LEV

Table 1 - Task 4 Walk Behind Saw

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(iv) Walk-behind saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. ▪ When used outdoors. ▪ When used indoors or in an enclosed area.	  (Half mask required) None APF 10	  (Half mask required) None APF 10

Without water control

With water control

Table 1 - Task 5 Drivable Saw

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(v) Drivable saws	For tasks performed outdoors only: ▪ Use saw equipped with integrated water delivery system that continuously feeds water to the blade. ▪ Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None

Without water control

With water control

Table 1 - Task 6
Rig-Mounted Core Saws or Drills

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(vi) Rig-mounted core saws or drills	▪ Use tool equipped with integrated water delivery system that supplies water to cutting surface. ▪ Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None

With water control

Table 1 - Task 7 Handheld and Stand-Mounted Drills

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills)	• Use drill equipped with commercially available shroud or cowling with dust collection system. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. • Use a HEPA-filtered vacuum when cleaning holes.	None	None

With LEV

Table 1 - Task 8 Dowel Drilling Rigs

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(viii) Dowel drilling rigs for concrete	For tasks performed outdoors only: • Use shroud around drill bit with a dust collection system. Dust collector must have a filter with 99% or greater efficiency and a filter-cleaning mechanism. • Use a HEPA-filtered vacuum when cleaning holes.	APF 10  (Half mask required)	APF 10  (Half mask required)

Without LEV

With LEV

Table 1 - Task 9 Vehicle-Mounted Drilling Rigs

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(ix) Vehicle-mounted drilling rigs for rock and concrete	Use dust collection system with close capture hood or shroud around drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector.	None	None
	OR		
	Operate from within an enclosed cab and use water for dust suppression on drill bit.	None	None

Table 1 - Task 10 - Jackhammers and Handheld Powered Chipping Tools

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(x) Jackhammers and handheld powered chipping tools	Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact. ▪ When used outdoors. ▪ When used indoors or in an enclosed area.	None APF 10	APF 10 APF 10
	OR Use tool equipped with commercially available shroud and dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. ▪ When used outdoors. ▪ When used indoors or in an enclosed area.	  (Half mask required) None APF 10	  (Half mask required) APF 10 APF 10

Without water control

With water control

Table 1 - Task 11 Handheld Grinders for Mortar Removal (i.e., Tuckpointing)

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(xi) Handheld grinders for mortar removal (i.e., tuckpointing)	Use grinder equipped with commercially available shroud and dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.	APF 10   (Half mask required)	APF 25  

Without LEV

With LEV

Table 1 - Task 11 Handheld Grinders for Mortar Removal (i.e., Tuckpointing)

- CPWR Research Project
- Tuckpointing - Bosch 1775E grinder w/DustControl 2900c vacuum and Dust Director shroud (Price ~$1,700)

Without LEV

With LEV

Table 2. Respirable Silica Exposures While Grinding Mortar[A]

	Mean, mg/m³ (range)	Std. Dev.	Percent Reduction	Hazard Ratio[B]
Bosch with Dust Director Shroud and DustControl 2900c Vacuum	0.091 (<0.069 - 0.137)	0.027	98.7	1.81
Bosch with no Control	7.23 (4.57 – 9.90)	1.94	NA	145

[A] n = 5 samples with the use of the LEV system and n = 7 samples without the use of the LEV system
[B] Hazard Ratio = measured exposure/NIOSH REL of 0.05 mg/m³

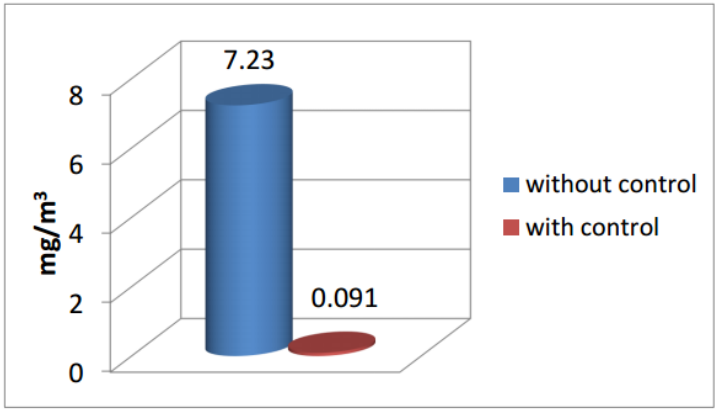


Table 1 - Task 12 Handheld Grinders for Uses Other than Mortar Removal

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(xii) Handheld grinders for uses other than mortar removal	For tasks performed outdoors only:		
	Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface.	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		
	OR		
	Use grinder equipped with commercially available shroud and dust collection system.		
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		
	Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.		 (Half mask required)
	• When used outdoors.	None	None
	• When used indoors or in an enclosed area.	None	APF 10

Without LEV

With LEV

Table 1 - Task 13 Walk Behind Milling Machines

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(xiii) Walk-behind milling machines and floor grinders	Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. OR Use machine equipped with dust collection system recommended by the manufacturer. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.	None None	None None

Without LEV

With LEV

Table 1 - Task 14 Small Drivable Milling Machines (<½ lane)

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(xiv) Small drivable milling machines (less than half-lane)	Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant. Operate and maintain machine to minimize dust emissions.	None	None

Table 1 - Task 15 Large Drivable Milling Machines (>½ lane)

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

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

Table 1 - Task 16 Crushing Machines

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(xvi) Crushing machines	Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points). Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions. Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station.	None	None

Table 1 - Task 17 Abrading or Fracturing Silica-Containing Materials

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(xvii) Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials	Operate equipment from within an enclosed cab.	None	None
	When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None

NOTE: When the operator exits the enclosed cab and is no longer actively preforming the task, the operator is considered to have stopped the task. However, if other abrading, fracturing, or demolition work is performed by other heavy equipment and utility vehicles in the area while an operator is outside the cab, that operator is considered to be an employee "engaged in the task" and must be protected by the application of water and/or dust suppressants.

Table 1 - Task 18 Grading and Excavating Silica-Containing Materials

TABLE 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials	Apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None
	OR		
	When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None	None

Must use water and/or dust suppressants as necessary to minimize dust emissions when:

- equipment is not equipped with enclosed, pressurized cabs, or
- employees other than the operator are engaged in the task.

Table 1 – Tasks 17 and 18

If working from/in enclosed booth or cab, it must be…

1. Free as practical of settled dust
2. Doors seals/closing mechanisms work
3. Gaskets and seals in good condition
4. Under positive pressure via delivered air
5. Intake air filtered and heated/AC

d) Alternative Exposure Controls Methods

- "For tasks not listed in Table 1…" or if Table 1 cannot be met
- Exposure Assessment (i.e., employee monitoring) required where employees may "reasonably be expected to be exposed above the AL"
- New PEL (as an 8-hour TWA) applies

d) New 8-Hour PEL

- FORMER OSHA PELs:
  - *Approx. 0.10 mg/m³ for general industry*
  - *Approx. 0.25 mg/m³ for construction and maritime*
  - *Derived from a formula*
  - *Adopted in 1971*
- NEW OSHA PEL: 0.05 mg/m³ (or 50 µg/m³)
  - *One limit for all industries and all forms of crystalline silica*
  - *50% reduction of the general industry PEL*
  - *80% reduction for construction and shipyards*

Distribution of 8-hr TWA PBZ Respirable Quartz Exposures of At-Risk Workers by Task - Construction Industry

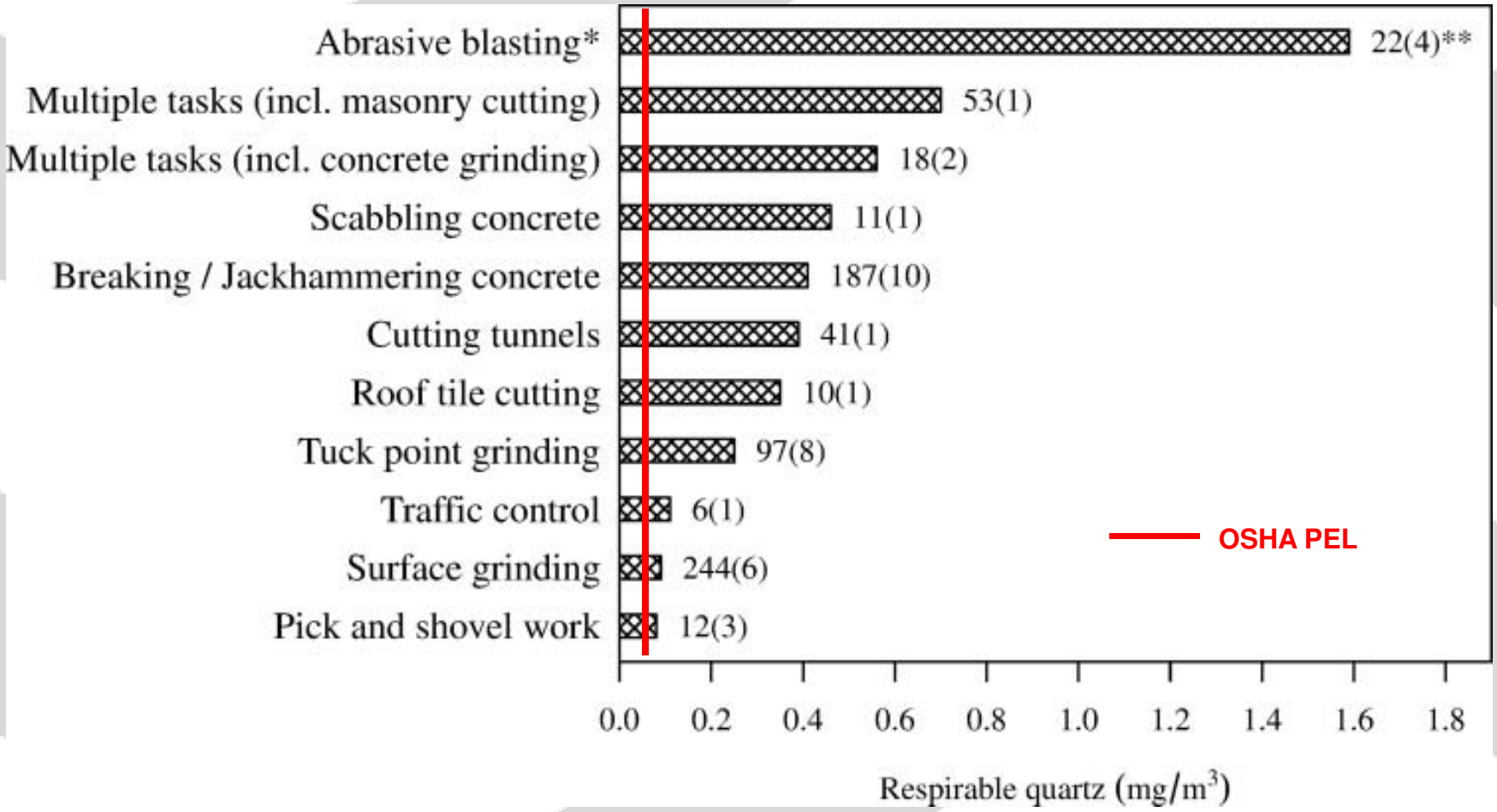
Task	Number of FTE At-Risk Workers (and percent of total) in Given Range							
	<=25 (µg/m³)	>25 to <=50 (µg/m³)	>50 to <=100 (µg/m³)	>100 to <=250 (µg/m³)	>250 to <=1000 (µg/m³)	>1000 (µg/m³)	Total Number (µg/m³)	
Drywall Finishing	29,617 86.7%	2,278 6.7%	2,278 6.7%	0 0.0%	0 0.0%	0 0.0%	34,174 100.0%	7%
Earth Drilling	15,834 40.0%	3,958 10.0%	6,597 16.7%	7,917 20.0%	3,958 10.0%	1,319 3.3%	39,585 100.0%	50%
Grinding and Tuckpointing	1,997 4.7%	856 2.0%	4,564 10.8%	7,416 17.6%	15,118 35.8%	12,266 29.1%	42,217 100.0%	93%
Heavy Equipment Operator	196,011 79.2%	10,316 4.2%	20,633 8.3%	20,633 8.3%	0 0.0%	0 0.0%	247,593 100.0%	17%
Hole Drilling	3,613 22.2%	3,613 22.2%	7,226 44.4%	0 0.0%	1,806 11.1%	0 0.0%	16,258 100.0%	55%
Impact Drilling	3,941 13.0%	2,425 8.0%	5,153 17.0%	7,881 26.0%	8,791 29.0%	2,122 7.0%	30,312 100.0%	79%
Portable Masonry Saws	15,100 41.9%	3,897 10.8%	2,923 8.1%	8,768 24.3%	3,897 10.8%	1,461 4.1%	36,046 100.0%	47%
Stationary Masonry Saws	7,356 40.8%	1,471 8.2%	1,103 6.1%	5,517 30.6%	1,471 8.2%	1,103 6.1%	18,023 100.0%	52%
Milling	18,277 66.7%	0 0.0%	4,569 16.7%	0 0.0%	4,569 16.7%	0 0.0%	27,415 100.0%	34%
Rock Crushing	0 0.0%	0 0.0%	0 0.0%	105 20.0%	210 40.0%	210 40.0%	524 100.0%	100%
Underground Work	843 63.3%	222 16.7%	133 10.0%	89 6.7%	44 3.3%	0 0.0%	1,331 100.0%	20%
All Tasks	292,592 59.3%	29,037 5.9%	55,181 11.2%	58,327 11.8%	39,867 8.1%	18,482 3.7%	493,487 100.0%	35%

Source: ERG, 2008.

OSHA PEL

Construction Tasks with Silica Exposures

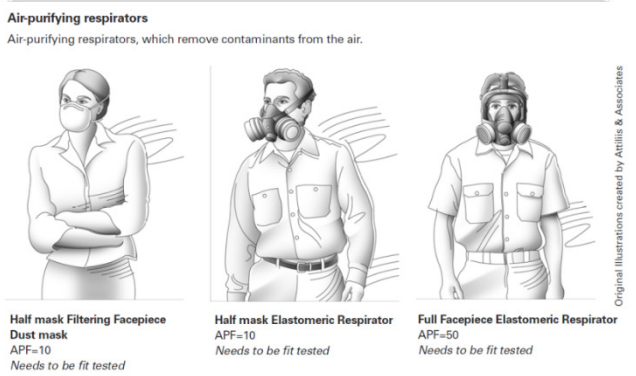
Exposures by Task vs. PEL



e) Respiratory Protection

Respirator use…

- When following Table 1
- If not following Table 1, when worker monitoring indicates need
- Consistent w/1910.134
  - Written Respiratory Protection Program
  - Fit-testing
  - Medical Evaluation
  - Training



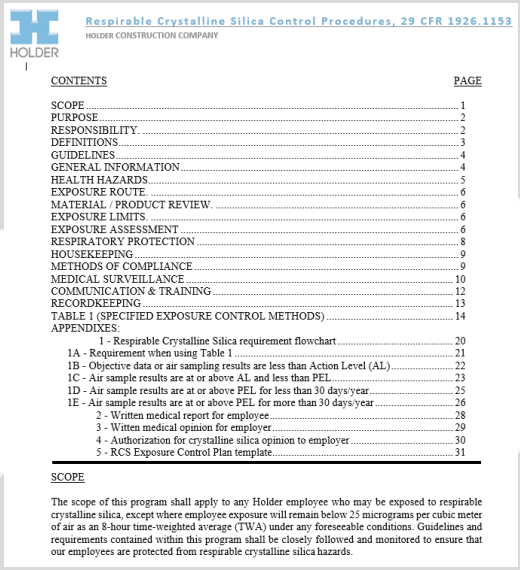
f) Housekeeping

- Dry sweeping NOT permitted…unless no other options
  - ➢ NOTE: OSHA now permits sweeping compounds as an acceptable option
- Use of compressed air NOT permitted unless…
  - ✓ Used w/LEV
  - ✓ No other method available

g) Written Exposure Control Plan

Exposure Control Plan (ECP) includes…

- Descriptions of tasks w/exposure and controls used
- Description of housekeeping used
- Procedures for restricting access
- Provisions for Competent Person to "make frequent and regular inspections…".
- Reviewed annually



Respirable Crystalline Silica Control Procedures, 29 CFR 1926.1153

HOLDER CONSTRUCTION COMPANY

CONTENTS PAGE

SCOPE

The scope of this program shall apply to any Holder employee who may be exposed to respirable crystalline silica, except where employee exposure will remain below 25 micrograms per cubic meter of air as an 8-hour time-weighted average (TWA) under any foreseeable conditions. Guidelines and requirements contained within this program shall be closely followed and monitored to ensure that our employees are protected from respirable crystalline silica hazards.

h) Medical Surveillance

- Required if respirator needed 30+ days/yr.
- Baseline required within 30 days
- Only results provided to employer (without additional authorization) are whether employee can/cannot wear a respirator

(Half mask required)

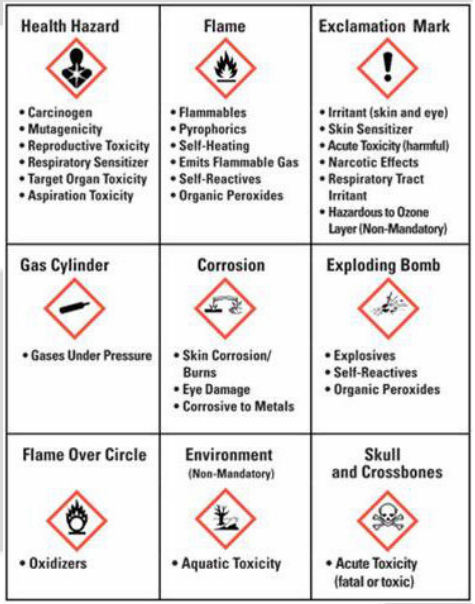
Silica Medical Surveillance Cost Estimate

Physical Examination	$50 - $70
Pulmonary Function Test (PFT)	$35 - $40
B-Read Chest X-Ray	$350 - $370
Tuberculosis Test (TB Test, PPD, Mantoux OR Blood Work)	$25 - $30 $120-150
The following may be administered prior to the above provided that documentation is maintained as part of the medical surveillance file:	
Respiratory Medical Questionnaire	$14 - $20
Respiratory Fit Test	$10 - $20 $60 - $75
Total Estimated Costs	**~$484 - $550**

i) Communication of Hazards

- **Training provided under Company's Hazard Communication Program**
- **Each employee can demonstrate knowledge and understanding of <u>at least</u>…**

1. Health hazards of silica;
2. Specific tasks that could result in exposure;
3. Specific measures implemented to protect employees;
4. Contents of the OSHA standard;
5. Identity of the Competent Person
6. The purpose and description of the medical surveillance program



Overview of OSHA General Industry Standard

OSHA's "Respirable Crystalline Silica" Standard

Similar in format to Construction Standard…

a) Scope/Application
b) Definitions
c) PEL
d) Exposure Assessment
e) Regulated Areas
f) Methods of Compliance
g) Respiratory Protection
h) Housekeeping
i) Medical Surveillance
j) Communication of silica hazards to employees
k) Recordkeeping
l) Dates

a) Scope/Application

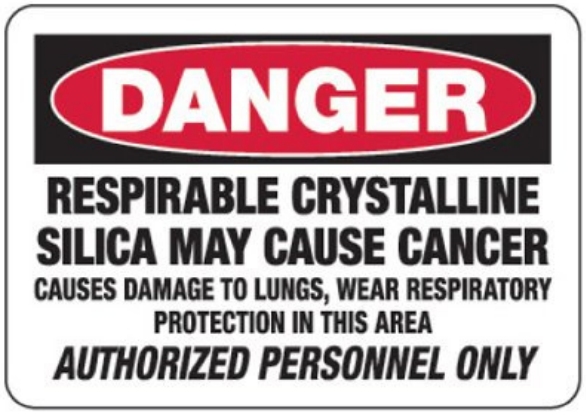
The standard applies to…

- "…all occupational exposures to respirable crystalline silica except in:
  - construction work,
  - Agricultural work, and
  - processing of sorptive clays (e.g., kitty litter)..."
- Std. does NOT apply if worker exposure < AL (25 µg/m^3 as 8-hour TWA) "under any foreseeable conditions"

b) Definitions

- **Objective data** – "information, such as industry-wide surveys or calculations…the data must reflect workplace conditions closely resembling or w/higher exposure"

- **Regulated Area** – "an area demarcated by the employer…exposure to RCS can reasonably be expected to exceed PEL"



c) PEL and d) Exposure Assessment

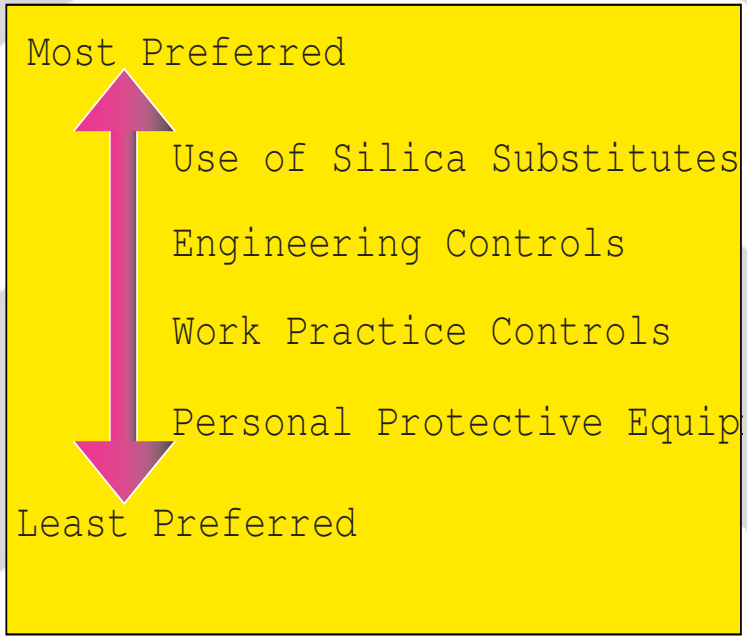
- PEL - No exposures >50 µg/m^3 as 8-hour TWA
- Assess each employee "who is or may reasonably be expected to be" exposed to RCS above AL
  - Provisions for re-assessment as a function of concentrations detected

e) Regulated Areas

- **Establishment** - "an area demarcated by the employer…exposure to RCS can reasonably be expected to exceed PEL"
- **Demarcation** – "in a manner that minimizes the no. of employees exposed"
- **Access** – "limit access…to persons authorized by employer, designated reps. and OSHA"

f) Methods of Compliance

- Based on "Hierarchy of Controls" to use feasible Engineering and Work Practice controls
- Written ECP
  - Same elements as Construction ECP minus provisions for Competent Person

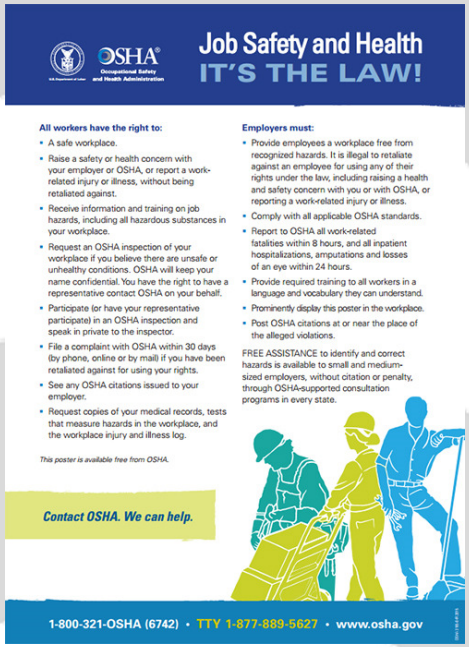


g) Respiratory Protection and h) Housekeeping

- **Respiratory Protection… consistent w/1910.134**
- **Housekeeping…**
  - **Dry sweeping NOT permitted…unless no other options**
  - **Use of compressed air NOT permitted unless…**
    - ✓ **Used w/LEV**
    - ✓ **No other method available**

h) Medical Surveillance

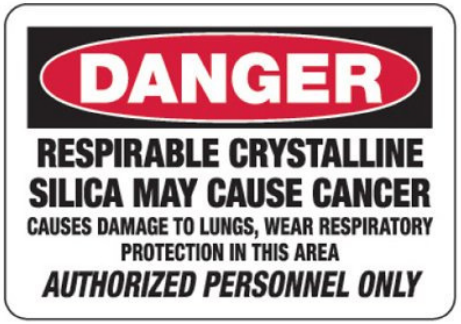
- **Required if worker exposed for 30+ days/yr.:**
  - ≥ PEL (effective June 2018)
  - ≥ AL (effective June 2020)
- **Baseline required within 30 days**
- **Only results provided to employer (without additional authorization) are limitations on respirator use and/or limitations on exposure to RCS**



j) Communication of Hazards

- **Training provided under Company's Hazard Communication Program**
- **Signs – discussed under e) Regulated Areas**
- **Each employee can demonstrate knowledge and understanding of <u>at least</u>…**

1. Health hazards of silica;
2. Specific tasks that could result in exposure;
3. Specific measures implemented to protect employees;
4. Contents of the OSHA standard;
5. The purpose and description of the medical surveillance program



OSHA's Silica Standard

Applicable Dates

- "**Construction** employers were required to comply by June 23, 2017" – **Enforcement effective Sept. 23, 2017**

- "**General Industry** comply w/all except AL trigger for medical surveillance by **June 23, 2018**"

Thank You!

dkubeldis@amerisafegroup.com