Crystalline Silica
Developing Work Plan and Monitoring

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What is Silica?

- Chemical Compound is SiO_2
- 100 times smaller than sand on a beach
- Makes up 15% of the earth's crust
- Sand, Gravel, Granite, Mineral Ores, other "hard" rocks
- α-Quartz (most common) - makes up 90-95% of all sand and silt
- Cristobalite and Tridymite – other forms
- "Respirable dust" means it is small enough to get past the body's defenses.

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How do exposures occur?

- Cutting, sawing, grinding, drilling crushing operations.
- Exposures created during work operations involving stone, rock, concrete, brick, block, mortar, and industrial sand.

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Background on Regulation

- Final OSHA Rule – March 25, 2016
- Construction Industry must comply by 9/23/2017
- Three month delay issued in early April
- Will affect 2 million construction workers
- GAME CHANGER!!!

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OSHA Health Findings

(in preamble)

- Over 600 deaths/yr and 900 new silicosis cases prevented by rule
- Crystalline Silica categorized as respiratory toxin that causes silicosis, COPD and lung cancer
- OSHA also links occupational silica exposure with kidney disease
- Rule states more than 50 peer-reviewed studies were evaluated and found links between silica exposure and lung cancer in at least 10 industries

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OSHA Rulemaking history

- NIOSH issues REL of 50 µg/m^3 for RCS in 1974.
- OSHA launched emphasis programs dating back to 1997 IARC classification; current NEP required 2% of all OSHA inspections to be silica related
- Draft proposal reviewed by SBREFA panel 2003
- Proposed rule issued in 2013 (after 2 years at OMB), 3 weeks of public hearings
- OSHA evaluated over 1,700 written comments and 200 live statements (plus cross-exam by public and panel)
- OSHA's adopted PEL is consistent with NIOSH REL; action level is consistent with ACGIH TLV.

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Changes to OSHA Rule

- Revised to exclude tasks that involve low exposures.
- OSHA opted not to include worker medical removal provisions.
- OSHA removed provisions that barred worker rotation.
- Standards do not apply where worker exposures remain below 25 $\mu g/m^3$ for 8 hr TWA under foreseeable conditions (Employer must have evidence to support this exception).
- No requirement for protective clothing.
- All employers must have written exposure control plan and construction must have competent person to implement plan.

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OSHA's Economic Analysis

- Total Annualized Costs: $1.030 billion including:
  - Engineering controls: $661.5 million
  - Respirators: $32.9 million
  - Exposure assessment: $96.2 million
  - Medical Surveillance: $96.4 million
  - Familiarization & Training: $95.9 million
  - Regulated Area: $2.6 million
  - Written Exposure Control Plan: $44.3 million
- Annualized benefits monetized: $8.687 billion
  - Costs of prevented fatal lung cancers, silicosis and other respiratory diseases, renal disease and other silica-related mortality
- Net benefits: $7.657 billion

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OSHA Requirements

- Limit worker exposures by using Table 1 or respirators
- Determine worker exposure if not using Table 1 – Monitoring
- Establish and implement a Written Exposure Control Plan
- Designate a Competent Person
- Restrict housekeeping practices that expose workers
- Offer medical exams
- Train workers
- Keep records

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Exposure limits in OSHA Construction Industry Regulation 29 CFR 1926.1153

- Permissible Exposure Limit (PEL) = 50 µg/m^3, 8-hr TWA
- Action Level (AL) = 25 µg/m^3, 8-hr TWA (same as current ACGIH TLV)

µg/m3 = micrograms per cubic meter

8-hr TWA = Time weighted average exposure over highest eight hours of exposure

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New vs. Existing PELs

	NEW (9/23/17)	EXISTING
OSHA PEL	50 µg/m^3	250 µg/m^3

Now we can see why it is a "GAME CHANGER!"

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The "BIG CHANGE"

Table 1

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Table 1 Example

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

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Table 1 Example

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Table 1 Exemption!!!

Employers who follow Table 1 are **NOT** required to measure worker exposure to silica and are **NOT** subject to the PEL!!!

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Written Exposure Control Plan

- Plan must include following elements:
  - Description of tasks involving exposure to respirable crystalline silica.
  - Description of engineering controls, work practices, and respiratory protection used to limit worker exposure for each task – engineering and WPC must be used unless employer demonstrates not feasible.
  - Description of housekeeping measures used to limit employee exposure dry sweeping, dry brushing, and use of compressed air not allowed (unless compressed air is part of ventilation system that captures dust cloud).
  - A description of the procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to RCS and their level of exposure, including exposures generated by other employers.
- Employer must review and evaluate effectiveness of written plan at least annually and update as necessary.
- Plan must be available for exam and copying by OSHA rep.

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Cost of Written Exposure Control Plan

$895.00

Annual review: $445.00

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Employee Monitoring

- Must meet requirements in Appendix A.
- Sample must comply with ISO 7708:1195

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Changes in OSHA Monitoring requirements

- Samplers with a 4 µm cut-point collect more contaminant mass than those with 3.5 µm cutpoint.
- So they are more conservative/protective of worker health.

- A simple explanation:
  - If you were collecting particles 3.5 µm and smaller in the past and then change to collecting particles 4 µm and smaller, you will collect more particles.
  - Also you will collect bigger particles which weigh more. Thus more contaminant mass.

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Exposure Monitoring

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Respirable Dust Samplers to meet ISO 7708 and OSHA Criteria

- On page 16439, OSHA notes:

The new silica rule "will permit employers to use ANY sampling device that conforms to the ISO/CEN convention".

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New Samplers

- Page 16439 goes on to say:

"There are also personal impactors available for use at flowrates from 2 to 8 L/min that have been shown to conform closely with the ISO/CEN convention".

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Personal Samplers

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Exposure Monitoring

- Performance Option:
  - The employer shall assess the 8-hour TWA exposure for each employee on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to respirable crystalline silica.

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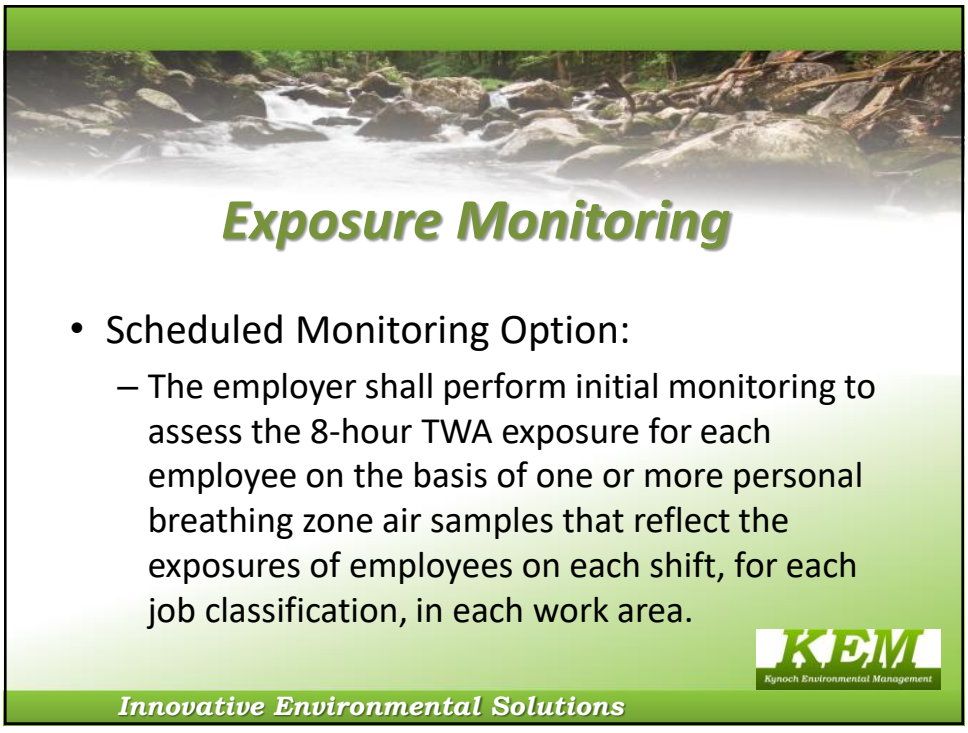
Exposure Monitoring
• Scheduled Monitoring Option:
– The employer shall perform initial monitoring to assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, in each work area.
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Cost of Exposure Monitoring
$650 per day, plus $110 per sample analysis
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Delivering a Complete Solution

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