

# *Impact of the Proposed Silica Standard on Well Completions Operations*

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# Where we've been

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- ▶ Identified that respirable crystalline silica (RCS) is emitted while handling proppant
- ▶ Worker exposures to RCS may exceed prescribed limits
- ▶ Worker awareness of this hazard has increased due to hazard communication efforts
- ▶ Respirator use among exposed workers has likely increased as well
- ▶ Various dust mitigation / minimization controls have been investigated and implemented
  - ▶ Surfactants
  - ▶ Passive and active dust control systems
  - ▶ Covers

# Occupational Disease & Silica

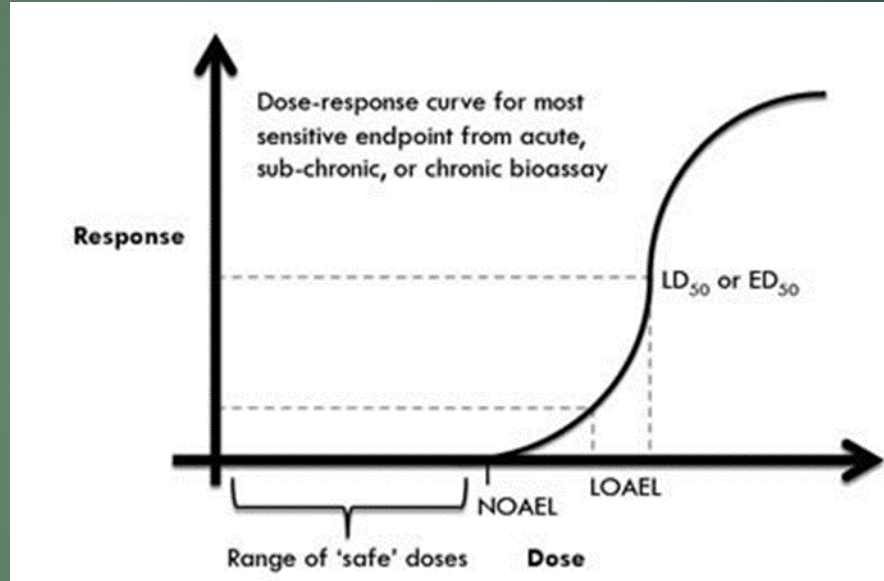
## Silica Can Cause:



Remy-Jardin M, Degraef JM, Beuscart R, et al. Coal workers pneumoconiosis: CT assessment in exposed workers and correlation with radiographic findings. *Radiology* 177:363-371, 1990

- ▶ Silicosis, Lung Cancer
- ▶ Kidney Disease, COPD
- ▶ Pulmonary Tuberculosis, Autoimmune Disease

## Dose & Response



Courtesy: SC Coastal Pesticides.org

- ▶ “Dosis sola facit venenum” – Paracelsus, 1493
- ▶ What is a safe dose?

# Dose

- ▶ Amount of the toxicant (silica) entering the body
- ▶ Primary route of exposure = inhalation
- ▶ Personal Breathing Zone (PBZ) “exposure” as an indicator
- ▶ Modulating factors = PBZ concentration and time

$$\frac{C(t) + C(t) + C(t) \dots \dots}{480 / 600 / 720m}$$

- ▶ Concentration affected by distance from emission source



Courtesy: NIOSH/CDC

# Workplace Health Risk

- ▶ Limits (PEL, STEL, Ceiling, REL, TLV<sup>®</sup>) define acceptable risk
  - ▶ OSHA PEL / STEL are prescribed limits
- ▶ Smaller particles cause more damage
  - ▶ 4µm or less (+/-) or “respirable”
- ▶ Current PEL (1969)  $\cong 192 \mu\text{g} / \text{m}^3$ 
  - ▶ 50% quartz in respirable fraction
- ▶ Proposed PEL (2013) =  $50 \mu\text{g} / \text{m}^3$ 
  - ▶ Action Level =  $25 \mu\text{g} / \text{m}^3$



Courtesy SKC, Inc.

# Exposure Assessment

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## Initial

- ▶ Sample all employees or representative groups
- ▶ May use “objective data”
- ▶ Defines workers subject to periodic monitoring

## Periodic

- ▶ Fixed Schedule
  - ▶ 3 or 6 month rotation
- ▶ Performance Option
  - ▶ Assess based on objective data & sample results
  - ▶ Re-assess if conditions change

# Risk Reduction

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## 1. Engineering

Control to lowest “feasible” level, supplement with other control measures

- Dust capture systems
- Covers on emission points
- Surfactants / treatments

## 2. Administrative

Control with work practices, mainly distance

- Access control
- Training
- Decontamination
- Cannot rotate workers

## 3. PPE

Control remaining risk with respiratory protection and/or disposable clothing

- Respiratory Protection Program
- Change in PEL may limit respirator choice
  - Current MUC  $\cong 1920 \mu\text{g}/\text{m}^3$
  - Future MUC =  $500 \mu\text{g}/\text{m}^3$

# Access Control

- ▶ Areas where the PEL could be exceeded
- ▶ Demarcated, access limited to workers with respirators
- ▶ Disposable clothing and/or decontamination area required

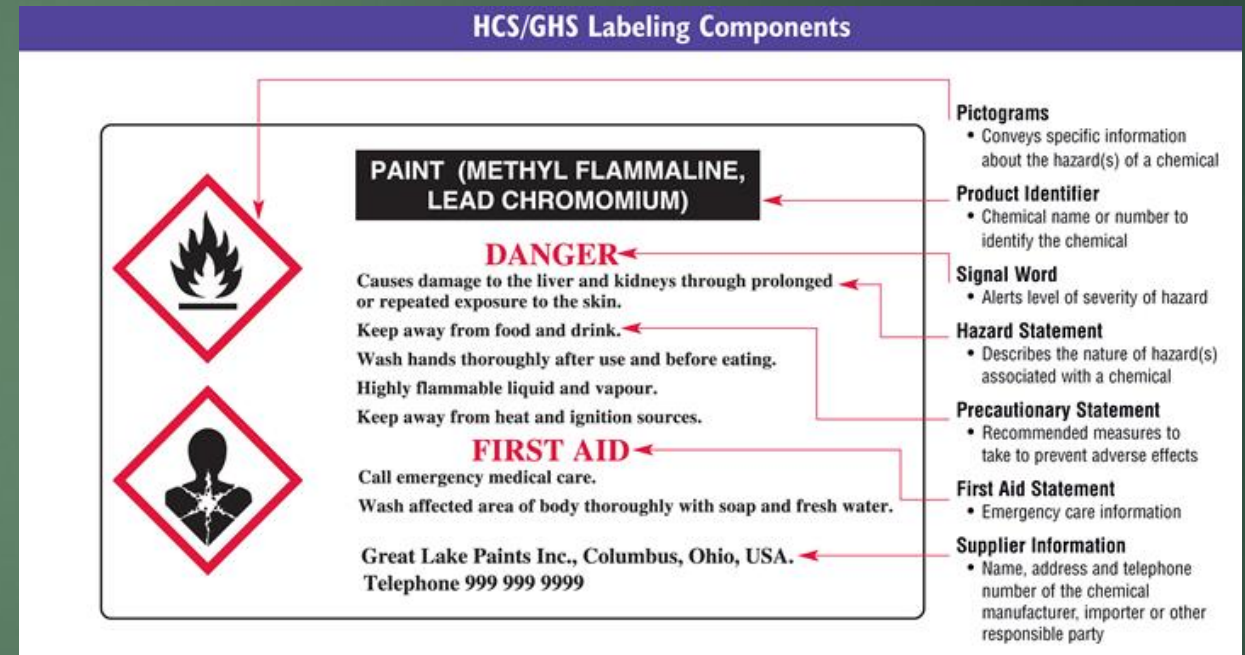
## Two Strategies:

- ▶ Regulated Area: fixed area, implies permanence
- ▶ Written Access Control Plan: managed by a “Competent Person”
  - ▶ Identify, demarcate, and communicate areas  $\geq$  PEL
  - ▶ Must be available to employees - and reviewed / evaluated annually



# Training & Communication

- ▶ Overall Hazard Communication program that includes respirable silica
  - ▶ Labels, access to SDS
  - ▶ Training including specific silica health effects
- ▶ Training curriculum must include specific educational elements related to silica
- ▶ Silica standard must be accessible in the workplace



# Other Requirements

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## Medical Surveillance

- ▶ Workers exposed to  $\geq$  PEL for 30 days or more annually
- ▶ Initial within 30 days of employment and every three years afterward
- ▶ Checking for early signs of silica-related disease in exposed workers
- ▶ Managed by a PLHCP (health care professional)

## Recordkeeping

- ▶ Air monitoring / sampling data (with specific parameters including SSN)
- ▶ Objective data
- ▶ Worker medical surveillance records
- ▶ Maintain in accordance with 29 CFR 1910.1020: “Access to employee exposure and medical records”

# What does this mean?

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- ▶ MUC of current respirators are more likely to be exceeded without engineering controls
- ▶ Industry use of engineering controls should become more widespread
- ▶ Area measurements will be necessary to define access control zones
- ▶ Competent Person knowledge and vigilance will be key element in controlling worker exposures
- ▶ API / BVNA data storage project will be helpful for initial exposure assessments
- ▶ Disposable clothing will likely be decontamination strategy of choice
- ▶ Medical surveillance programs will be hindered by rotating nature of workforce

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