

# **CRYSTALLINE SILICA**

## **PRACTICAL INFORMATION FOR REFINERY EMPLOYEES**

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# WHAT IS CRYSTALLINE SILICA?

- Silica is a naturally occurring mineral found in rock, sand, stone, concrete, brick, mortar, refractory, etc. It occurs in both crystalline and amorphous forms.
- Crystalline silica is distinguished by a jagged outward appearance and a repeating internal pattern.
  - Most common natural forms include quartz, cristobalite, and tridymite



# WHEN IS SILICA HAZARDOUS?

- When the particles are small enough (respirable) to reach the gas exchange region of the lungs (alveoli)

## Particle Size Comparison



Human hair (about 70 $\mu$ m wide)

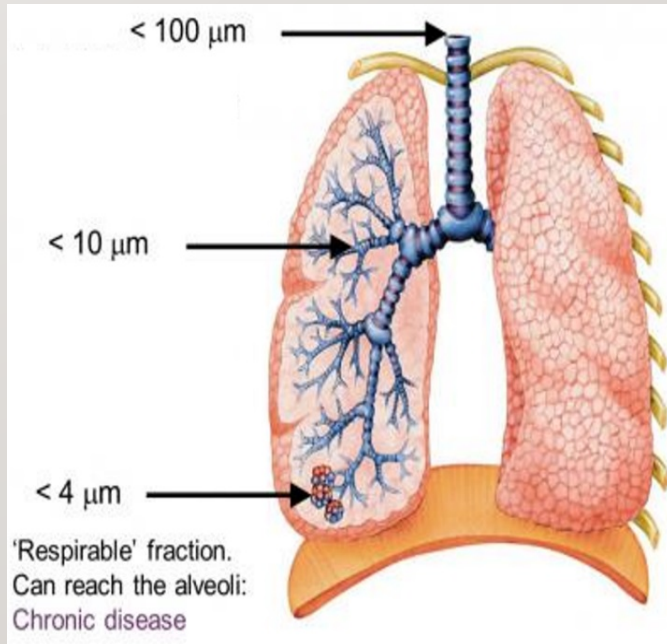


Grain of sand (about 50 $\mu$ m wide)



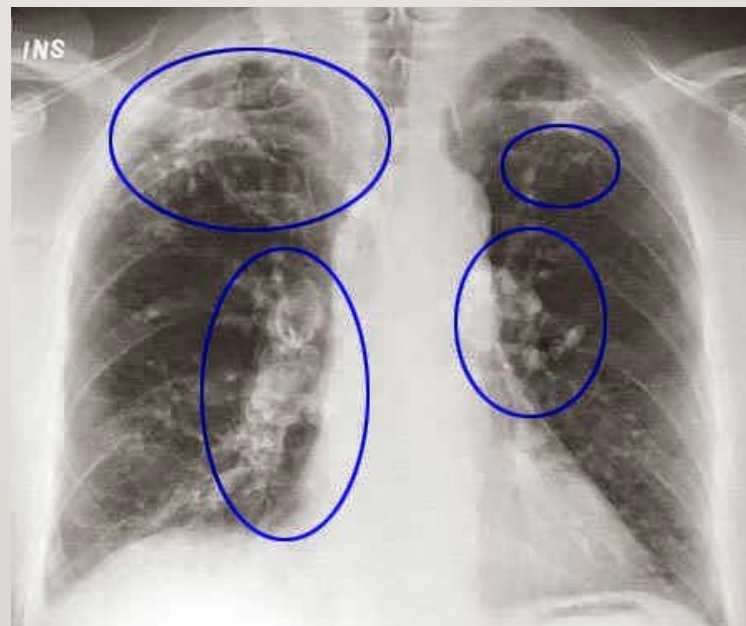
Respirable (less than or equal to 4 $\mu$ m)

$\mu$ m = micrometer  
"one millionth of one meter"



# WHY IS SILICA HAZARDOUS?

- Silicosis
  - respirable crystalline silica particles damage lung tissue
  - body mounts an immune response against the particles
  - scar tissue reduces oxygen transfer
  - no cure
- Lung Cancer
  - IARC Category 1
- Kidney Disease
- Chronic Pulmonary Disease



# REFINERY SILICA TASKS

- Materials

- Refractory
- Fireproofing
- Concrete
- Blast media
- Coatings

- Tasks

- Mixing
- Spraying/gunning
- Cutting
- Chipping
- Drilling
- Abrasive blasting
- Cleaning
- Jackhammering



# HIGHLIGHTS FROM NEW STANDARD

- More stringent PEL (permissible exposure limit) of 50  $\mu\text{g}/\text{m}^3$
- OSHA offers employers three options to demonstrate compliance with PEL:
  1. **Table 1:** a table of pre-defined tasks and control methods
  2. **Performance Option:** use objective data to prove that silica exposures are below the PEL
  3. **Scheduled Air Monitoring:** scheduled air monitoring to ensure employee exposures remain below the PEL
- Written exposure control plan
- Medical surveillance (exams) must be offered for employees required to wear a respirator for 30 or more days per year.
- Competent person
- Awareness Training

# TABLE 1 EXAMPLE

Table 1 - Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica

<i>Equipment/task</i>	<i>Engineering and work practice control methods</i>	<i>Required respiratory protection and minimum assigned protection factor</i>	
		<i>(APF)</i>	
		<i>≤ 4 hours/shift</i>	<i>&gt; 4 hours/shift</i>
(i) Stationary masonry saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		

# TABLE 1 EXAMPLE

<i>Equipment/task</i>	<i>Engineering and work practice control methods</i>	<i>Required respiratory protection and minimum assigned protection factor (APF)</i>	
		<i>≤ 4 hours/shift</i>	<i>&gt; 4 hours/shift</i>
(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	None	APF 10.
	-When used indoors or in an enclosed area	APF 10	APF 10.
	<b>OR</b>		
	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	None	APF 10.
	-When used indoors or in an enclosed area	APF 10	APF 10.



# CONTROLS

- OSHA has specified equipment/ task-specific engineering and work practice control methods
- Employers must monitor personal employee exposures if not using Table 1 controls or “objective data.”
- Employers must document exposure control methods in a written exposure control plan and have a Competent Person administer the plan.



# COMPETENT PERSON

- Definition: “An individual capable of identifying existing and foreseeable respirable crystalline silica hazards in the workplace and has authorization to take prompt corrective measures to eliminate or minimize them”.
- Each contractor shall designate a Competent Person
- Responsibilities
  - Ensure implementation of the written exposure control plan
    - Understand tasks that present a silica hazard
    - Engineering & work practice controls
    - Respiratory protection
    - Housekeeping
    - Restricted access
  - Make frequent and regular inspections of job sites, materials, and equipment

# CONTROLS

- Elimination
- Wet methods
  - Control dust at the source with water spray
  - Tools that require water for blades/bits
- Local exhaust ventilation
  - Collects dust at the source
- Respiratory protective equipment
- HEPA vacuum cleaners
- Restricted areas
- Enclosed cabs and booths
  - Must have intake air filter that is 99% efficient in the 0.3-10.0 $\mu$ m range

# CONTROLS

Wet Methods



Dust collection and Enclosures



# TRAINING

- Health hazards of crystalline silica
- Tasks that may generate respirable silica
- Controls
  - Engineering
  - Work practice
  - Respiratory protection
- Identity of competent person
- Medical surveillance

# COMPLIANCE DATES

- Construction – 9/23/2017
- General Industry – 6/23/2018



QUESTIONS?

