



## CRYSTALLINE SILICA REVIEW 20170409

### 1. CRYSTALLINE SILICA - INTRODUCTION

- Naturally Occurring Material
- Silicon Dioxide (SiO<sub>2</sub>) - Ubiquitous
- Present in building materials
- Cutting, chipping, sanding or sawing activities may release harmful microscopic dust particles which may be inhaled & deposited deep in the lungs
- Sand
- Concrete Products
- Cut stone Products
- Mortar
- Glass Products
- Pottery Products
- Structural clay products (Bricks)
- Ceramic Products
- Foundries
- Paintings and coatings
- Jewelry production

### 17. DEFINITIONS:

- “Respirable crystalline silica” means quartz, cristobalite, and/or tridymite contained in airborne particles that are determined to be respirable – up to 10µm
- Competent Person means
  - “an individual who is capable of identifying existing and foreseeable respirable silica hazards in the workplace and
  - who has authorization to take prompt corrective measures to eliminate or minimize them”

### 22. ANALYSIS OF CRYSTALLINE SILICA

- OSHA ID-142 - Analytical Method for Crystalline Silica in the Workplace
- Air Samples – 5µm PVC Filter & Cyclone
- XRD – X-ray Diffraction Analysis

### 26. HEALTH EFFECTS

- Primary Entry: Inhalation
- Natural Defense Mechanisms Of The Human Body:
  - Nose Hairs – a crude air filter
  - Cilia - “Mucociliary Escalator”
  - Macrophage – giant white blood cells
- Risk Factors
  - Duration & Intensity Of Exposure – Cumulative
  - Age at First Exposure
  - Particle Size Of Silica Inhaled
  - Lung Cancer, Arthritis
  - Synergistic - Cigarette Smoking + work with Silica unprotected – INCREASED RISK

### 38. SILICA DISEASES

- Latency Period up to 30 years
- Dependent on exposure, dose & duration

### 41. SILICOSIS – (Not a Cancer)

- Cumulative Fibrotic Scarring, dose response
- Diffuse Interstitial Fibrosis
- Caused By Accumulation Of Particles In Lung

- White Blood Cell Defense Ineffective

### 46. LUNG CANCER – Common

- High Risk to Workers
- Mucociliary Escalator - Nicotine Paralyzes
- Latency Period up to 30 years
- Strong Cumulative Dose-Response Relationship

### 51. SILICOSIS RELATED DISEASES

- Susceptible to Infections
- Tuberculosis
- Fungal infections
- Immune Compromised Diseases
- Scleroderma (Hardening of Skin)
- Nephritis (Kidney Disease)
- Rheumatoid Arthritis
- Stress on Organ Systems
- Coronary Stress – Heart Attack
- Lung - Chronic Obstructive Pulmonary Disease
- Lung - Emphysema

### 63. MEDICAL SURVEILLANCE - Triggers

- 1) Exposure ≥ AL > 30 days/year
- 2) Exposure > PEL
- Wearing a Negative Pressure Respirator - 30 days/year

### 67. MEDICAL SURVEILLANCE

- Within 30 days + EVERY 3 years
- Written Medical Surveillance Plan
- Medical & Occupational History
- Physician or Licensed Health Care Professional (PLHCP)
- Physical exam - Emphasis Respiratory System
- Pulmonary Function Tests (PFT)
- Baseline Tuberculosis Testing (TB)
- Chest x-ray
- Baseline - Prior to employment
- Every 5 years if <20 years exposure
- Every 2 years if >20 years exposure
- More frequently if requested by physician
- Upon Employment Termination
- Information To Physician
- Copy Of Standard And Appendices
- Description Of Duties
- Representative Exposure Levels
- Description Of PPE Used
- Information from Physician
- Written Opinion - Results Of Medical Exam
- Medical Conditions Which Place Employee At Increased Risk From Exposure
- Employee Limitations/Restrictions On PPE
- Examination Results & Medical Conditions Which May Result From Silica Exposure

### 91. PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Respirators
- HEPA (99.97% <0.3µm) N, R, P-100
- Written Respirator Protection Plan

- 95. Fit Test - Annual
- 96. Qualitative - Chemicals
  - 97. Saccharin, Banana Oil (isoamyl nitrate), Bitrex, Irritant Smoke (Stannic Chloride)
- 98. Quantitative - Instrument
  - 99. Portacount, Quantifit
- 100. User Seal Check – Each Use
- 101. Coveralls, Gloves, Shoes, Hard-hats, etc.

## 102. RECORDKEEPING

- 103. Medical Records – Length of Employment + 30 Years
- 104. Exposure Monitoring – 30 Years
- 105. Training – Length of Employment + 1 Year

## 106. REGULATIONS – OSHA Worker Protection

- 107. Construction - OSHA 29CFR1926.55
  - 108. Scope
  - 109. Definitions
  - 110. Specified Exposure Control Methods
  - 111. Alternative Exposure Control Methods
  - 112. Permissible Exposure Limit
  - 113. Exposure Assessment
  - 114. Regulated Areas
  - 115. Methods of Compliance
  - 116. Respiratory Protection
  - 117. Housekeeping
  - 118. Written Exposure Control Plan
  - 119. Medical Surveillance
  - 120. Communication of Respirable Crystalline
  - 121. Silica Hazards to Employees
  - 122. Recordkeeping
- 123. OSHA General Industry & Maritime – 29CFR1910.1000
- 124. OSHA HAZCOM 29CFR1910.1053

## 125. Negative Pressure Enclosure = NPE <-0.02” H<sub>2</sub>O

- 126. # NAMS = for 4 air changes per hour =
- 127.  $[\text{Vol ft}^3 * 4/\text{hr}] / [60 \text{ min/hr} * \text{NAM} (\text{ft}^3/\text{min})]$
- 128.  $[\text{Vol ft}^3] / [15 \text{ min} * \text{NAM} (\text{ft}^3/\text{min})]$

## 129. OSHA Approved State-Plans

- 130. 22 States - Cover Public & Private Employees
  - 131. AK, AZ, CA, HI, IN, IA, KY, MD, MI, MN, OR, PR, SC, TN, UT, VT, VA, WA, WY
- 132. 6 States – Cover Public Sector Employees Only
  - 133. CT, IL, ME, NJ, NY, Virgin Islands

## 134. EPA National Ambient Air Quality Standards for PM<sub>10</sub>

- 135. a 24-h average PM<sub>10</sub> standard of 150  $\mu\text{g}/\text{m}^3$
- 136. an annual mean PM<sub>10</sub> standard of 50  $\mu\text{g}/\text{m}^3$

## 137. SILICA LEVELS

- 138. OSHA ACTION LEVEL (AL)  $\geq 25 \text{ ug}/\text{m}^3$  TWA
- 139. OSHA Permissible Exposure Limit (PEL)  $> 50 \text{ ug}/\text{m}^3$
- 140. ACGIH TLV =  $0.1 \text{ mg}/\text{m}^3 = 100 \text{ ug}/\text{m}^3$
- 141. NIOSH REL =  $0.05 \text{ mg}/\text{m}^3 = 50 \text{ ug}/\text{m}^3$