



## CRYSTALLINE SILICA REVIEW 20171119

### 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
- OSHA ID-142 – 10mm Nylon Cyclone
  - 480 min (8 hours) @ 1.7LPM = 816 Liters
- NIOSH 7500
  - Dorr/Oliver Nylon Cyclone @ 1.7 LPM
  - Higgins/Dewell HD Cyclone @ 2.2 LPM
  - Aluminum Cyclone @ 2.5 LPM
  - VOL – Min = 400L, Max = 1,000L
- XRD – X-ray Diffraction Analysis
  - Gravimetric Mass Analysis
  - THF Suspension – Ag Filter, then XRD
  - LOD = 5 ug

### 36. 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

### 48. SILICA DISEASES - miner's phthisis, grinder's asthma, potter's rot, etc.

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

### 51. SILICOSIS – (Not a Cancer)

- Cumulative Fibrotic Scarring, dose response
- Diffuse Interstitial Fibrosis
- Caused By Accumulation Of Particles In Lung
- White Blood Cell Defense Ineffective

### 56. LUNG CANCER – Common

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

### 61. 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 = COPD
  - Lung – Emphysema

### 73. MEDICAL SURVEILLANCE - Triggers

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

### 77. 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

- 90. Upon Employment Termination
- 91. Information To Physician
  - 92. Copy Of Standard And Appendices
  - 93. Description Of Duties
  - 94. Representative Exposure Levels
  - 95. Description Of PPE Used
  - 96. Information from Physician
  - 97. Written Opinion - Results Of Medical Exam
  - 98. Medical Conditions Which Place Employee At Increased Risk From Exposure
  - 99. Employee Limitations/Restrictions On PPE
  - 100. Examination Results & Medical Conditions Which May Result From Silica Exposure

**101. PERSONAL PROTECTIVE EQUIPMENT (PPE)**

- 102. Respirators
  - 103. HEPA (99.97% <0.3um) N, R, P-100
  - 104. Written Respirator Protection Plan
  - 105. Fit Test - Annual
    - 106. Qualitative - Chemicals
      - 107. Saccharin, Banana Oil (isoamyl nitrate), Bitrex, Irritant Smoke (Stannic Chloride)
    - 108. Quantitative - Instrument
      - 109. Portacount, Quantifit
  - 110. User Seal Check – Each Use
- 111. Coveralls, Gloves, Shoes, Hard-hats, etc.

**112. RECORDKEEPING**

- 113. Medical Records – Length of Employment + 30 Years
- 114. Exposure Monitoring – 30 Years
- 115. Training – Length of Employment + 1 Year

**116. REGULATIONS – OSHA Worker Protection**

- 117. Construction - OSHA 29CFR1926.55
  - 118. Scope
  - 119. Definitions
  - 120. Specified Exposure Control Methods
  - 121. Alternative Exposure Control Methods
  - 122. Permissible Exposure Limit
  - 123. Exposure Assessment
  - 124. Regulated Areas
  - 125. Methods of Compliance
  - 126. Respiratory Protection
  - 127. Housekeeping
  - 128. Written Exposure Control Plan
  - 129. Medical Surveillance
  - 130. Communication of Respirable Crystalline
  - 131. Silica Hazards to Employees
  - 132. Recordkeeping
  - 133. Specified exposure control methods. (1) For each employee engaged in a task identified on **Table 1**, the employer shall **fully and properly implement the engineering controls, work practices, and respiratory protection specified for the task on Table 1**, unless the employer assesses and limits the exposure of the employee to respirable crystalline silica in accordance with paragraph (d) of this section.
- 134. OSHA General Industry & Maritime – 29CFR1910.1000
- 135. OSHA HAZCOM 29CFR1910.1053

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

- 137. # NAMS = for 4 air changes per hour =
- 138. [Vol ft<sup>3</sup> \*4/hr] / [60 min/hr \* NAM (ft<sup>3</sup>/min)]
- 139. [Vol ft<sup>3</sup>] / [15 min \* NAM (ft<sup>3</sup>/min)]

**140. OSHA Approved State-Plans**

- 141. 22 States - Cover Public & Private Employees
- 142. AK, AZ, CA, HI, IN, IA, KY, MD, MI, MN, OR, PR, SC, TN, UT, VT, VA, WA, WY
- 143. 6 States – Cover Public Sector Employees Only
- 144. CT, IL, ME, NJ, NY, Virgin Islands

**145. EPA National Ambient Air Quality Standards for PM<sub>10</sub>**

- 146. a 24-h average PM<sub>10</sub> standard of 150 µg/m<sup>3</sup>
- 147. an annual mean PM<sub>10</sub> standard of 50 µg/m<sup>3</sup>

**148. SILICA LEVELS**

- 149. OSHA ACTION LEVEL (AL) ≥ 25 µg/m<sup>3</sup> TWA
- 150. OSHA Permissible Exposure Limit (PEL) > 50 µg/m<sup>3</sup>
- 151. ACGIH TLV = 0.1 mg/m<sup>3</sup> = 100 µg/m<sup>3</sup>
- 152. NIOSH REL = 0.05 mg/m<sup>3</sup> = 50 µg/m<sup>3</sup>

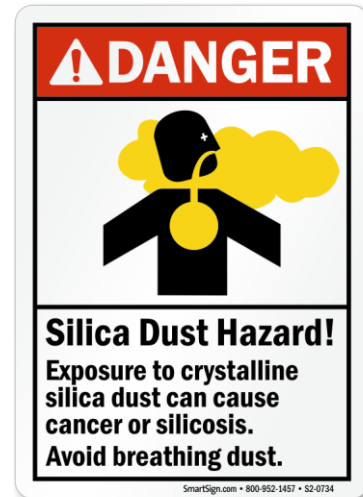




TABLE 1: SPECIFIED EXPOSURE CONTROL METHODS WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA

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	<p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p>	None	None
(ii) Handheld power saws (any blade diameter)	<p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <ul style="list-style-type: none"> <li>- When used outdoors.</li> <li>- When used indoors or in an enclosed area.</li> </ul>	None APF 10	APF 10 APF 10
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)	<p>For tasks performed outdoors only:</p> <p>Use saw equipped with commercially available dust collection system.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency.</p>	None	None
(iv) Walk-behind saws	<p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <ul style="list-style-type: none"> <li>- When used outdoors.</li> <li>- When used indoors or in an enclosed area.</li> </ul>	None APF 10	None APF 10
(v) Drivable saws	<p>For tasks performed outdoors only:</p> <p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p>	None	None





(xiv) Small drivable milling machines (less than half-lane)	<p>Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant.</p> <p>Operate and maintain machine to minimize dust emissions.</p>	None	None
(xv) Large drivable milling machines (half-lane and larger)	<p>For cuts of any depth on asphalt only:</p> <p>Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.</p> <p>Operate and maintain machine to minimize dust emissions.</p> <p>For cuts of four inches in depth or less on any substrate:</p> <p>Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.</p> <p>Operate and maintain machine to minimize dust emissions.</p> <p>OR</p> <p>Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant.</p> <p>Operate and maintain machine to minimize dust emissions.</p>	None	None
		None	None
		None	None
(xvi) Crushing machines	<p>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).</p> <p>Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote-control station.</p>	None	None
(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	<p>Operate equipment from within an enclosed cab.</p> <p>When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.</p>	None	None
		None	None

(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