NEW CRYSTALLINE SILICA RULE

PRESENTATION BY: TOM HUETTER, P.G.

Harbor



SILICA DUST HAZARD EXPOSURE TO CRYSTALLINE SILICA DUST CAN CAUSE CANCER OR SILICOSIS AVOID BREATHING DUST











Silica

What is silica?

- Silica (Si), also referred to as crystalline silica, is the second-most abundant element in the earth's crust.
- Quartz, cristobalite, and tridymite are the three most common crystalline forms of free silica – SiO₂
- Quartz is by far the most common; it is found abundantly in most rock types.
- Silica as quartz is the primary constituent of most sand.





Respirable Crystalline Silica





- In regards to crystalline silica, the finer particles (dust) can be respirable.
- Respirable crystalline silica is the portion of crystalline silica that is small enough to enter the gas-exchange regions of the lungs if inhaled.
- This includes particles with aerodynamic diameters less than approximately 10 micrometers (µm).

Silica Exposure

So, why are we concerned about silica?

- The health risks from inhaling dust and crystalline silica have been known since at least 1700, when Dr. Bernardino Ramazzini identified evidence of silicosis in stone cutters.
- In the early 1900s, Dr. Alice Hamilton similarly identified silicosis in granite cutters.
- Granite cutters in Vermont in the 1930s collectively bargained for and received ventilation as a result of silicosis fatalities.







Silica Exposure (continued)

- Several hundred workers died of acute silicosis as a result of the construction of the Hawks Nest Tunnel in West Virginia in the late 1920s to early 1930s.
- This led to Federal action including a National Silicosis Conference, which initiated a campaign to "Stop Silicosis"





Creation of OSH Act



- In 1971, the Occupational Safety and Health Act was passed which created the Occupational Safety and Health Administration (OSHA) and The National Institute for Occupational Safety and Health (NIOSH).
- OSHA is the regulatory branch which sets standards and enforces safety as a division of the Department of Labor.
- NIOSH is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness and is a branch of the Centers for Disease Control (CDC).



Engineering



Current Silica Exposure

- According to OSHA, approximately 2.3 million workers are exposed to respirable crystalline silica in their workplaces.
- This includes approximately 2 million construction workers and 300,000 workers in general industry:
 - Brick manufacturing
 - Foundries
 - Dimensional stone/countertop installation
 - Hydraulic fracturing



Workers in the construction, brick and foundry, and dimensional stone industries are exposed to silica by drilling, cutting, crushing, or grinding silica-containing materials such as concrete and stone.

Current Silica Exposure (continued)

- NIOSH began conducting field studies on frac locations across the country showing worker overexposure to respirable crystalline silica.
- At the same time, oil and gas exploration and service companies observed the potential risk and began conducting exposure monitoring on frac locations.
- Both NIOSH and industry studies showed that workers were being overexposed to respirable crystalline silica.



Current Silica Exposure (continued)

- How are individuals exposed to silica on frac locations? NIOSH - identified seven primary sources of dust:
 - 1. Release from the top hatches of the sand movers (primarily during filling operations)
 - 2. Dust ejected from fill ports on sand movers
 - 3. Release from the transfer belt under the sand movers
 - 4. Release from "dragon's tail" prior to going into the blender hopper
 - 5. Sand dropping into and mixing in the blender hopper
 - 6. On-site vehicle traffic, such as sand trucks
 - 7. Release from T-belt operations



Silica Hazards

What are the health hazards of silica?

- Silicosis (formerly known as miner's phthisis, grinder's asthma, or potter's rot) is a lung disease caused by breathing in very small particles of silica that cause inflammation and scarring in the lungs and reduces the lungs' ability to use oxygen.
- Workers who breathe silica dust day after day are at greater risk of developing silicosis.
- Breathing in silica also increases the risk of lung cancer and other diseases, such as tuberculosis, chronic obstructive pulmonary disease, and kidney and autoimmune diseases.



What is Silicosis?





- Silicosis is actually a type of pneumoconiosis:
 - Pneumoconiosis is the medical term for lung scarring caused by inhaled dust.
 - Pneumoconiosis can also occur from inhaled asbestos, coal, beryllium, and other inhalable dusts.
- There is no effective treatment for any pneumoconiosis, including silicosis

Silicosis Types

- Silicosis is classified into three types:
 - Chronic/classic
 - Accelerated
 - Acute

Slice of a lung / affected by silicosis



Chronic Silicosis

- Chronic/classic silicosis, the most common, occurs after 15–20 years of moderate to low exposures to respirable crystalline silica.
- Symptoms associated with chronic silicosis may or may not be obvious; therefore, workers need to have a chest x-ray to determine if there is lung damage.
- As the disease progresses, the worker may experience shortness of breath upon exercising and have clinical signs of poor oxygen/carbon dioxide exchange.
- In the later stages, the worker may experience fatigue, extreme shortness of breath, chest pain, or respiratory failure.



Accelerated and Acute Silicosis

- Accelerated silicosis can occur after 5–10 years of high exposures to respirable crystalline silica.
- Symptoms include severe shortness of breath, weakness, and weight loss.
- Acute silicosis occurs after a few months or as long as 2 years following exposures to extremely high concentrations of respirable crystalline silica.
- Symptoms of acute silicosis include severe disabling shortness of breath, weakness, and weight loss, which often leads to death.



Environmental Safety Engineering

Other Risks Associated with Silicosis

- Increased risk of tuberculosis & lung cancer.
- Degree of increased risk is highly variable and depends on several other factors, including:
 - immune system
 - exposure history (for TB),
 - amount of lung scarring
 - age
 - smoking history (for cancer).



Previous Silica Exposure Limits

- Several exposure limits had previously been set by OSHA, NIOSH & the American Conference for Government Industrial Hygienists (ACGIH):
 - OSHA previously established a Permissible Exposure Limit (PEL) for respirable dust of 5 milligrams per cubic meter (mg/m³). The PEL would be lowered if silica was present and was based on a calculation that was based on the percent of silica minerals.
 - Most industrial hygienists believed that the calculation method was outdated.
 - NIOSH Recommended Exposure Limit (REL) 0.050 mg/m³
 - ACGIH Threshold Limit Value (TLV) 0.025 mg/m³



New Silica Rule

- Due to the increased scrutiny of silica exposure, primarily related to hydraulic fracturing, OSHA and NIOSH began looking into revising the silica rule (which hadn't been updated since its initial creation in 1971).
- OSHA believed that the standards were outdated and did not adequately protect workers from silica-related diseases.
- Additionally, workers are being exposed to silica in new industries such as stone or artificial stone countertop fabrication as well as hydraulic fracturing.



Environmental Safety Engineering

New Silica Rule (continued)

- In 2013, OSHA published the proposed rule, which allowed input from various stakeholders.
- In response to extensive stakeholder input, the rule was substantially changed, while maintaining or improving worker protection.
- OSHA published the Final Rule on Silica on March 25, 2016. The rule is comprised of two standards, one for the construction industry, and one for general industry and maritime.
- The primary provision of the rule is that it:
 - Reduces the PEL for respirable crystalline silica to 50 mg/m³ of air, averaged over an 8-hour shift.



New Silica Rule (continued)

Additional provisions of the rule include:

- Requires employers to use engineering controls (such as water or ventilation) to limit worker exposure to the PEL; provide respirators when engineering controls cannot adequately limit exposure; limit worker access to high exposure areas; develop a written exposure control plan, offer medical exams to highly exposed workers, and train workers on silica risks and how to limit exposures.
- Provides medical exams to monitor highly exposed workers and gives them information about their lung health.
- Provides flexibility to help employers especially small businesses — protect workers from silica exposure.



Environmental Safety Engineering

Compliance Schedule

- Both standards contained in the final rule take effect on June 23, 2016, after which industries have one to five years to comply with most requirements, based on the following schedule:
 - **Construction** June 23, 2017, one year after the effective date.
 - **General Industry and Maritime** June 23, 2018, two years after the effective date.
 - **Hydraulic Fracturing** June 23, 2018, two years after the effective date for all provisions except Engineering Controls, which have a compliance date of June 23, 2021.



Environmental Safety Engineering



Should you have any questions, please contact:

Thomas Huetter, P.G. Harbor Environmental and Safety 5800 Evergreen Drive Little Rock, AR 72205 501-663-8800 thuetter@harborenv.com

