



Respirable Crystalline Silica

a MSHA Regulatory and Sampling Update/Review

FLORIDA AIHA 2023 FALL CONFERENCE

Ed Stuber, CIH,ROH,FAIHA| October 13, 2023

Agenda



- Industries with Potential Silica Exposures
- Exposure Hazards
- MSHA Silica Standard - Proposed
- Exposure Assessment
- Exposure Sampling
- Cost Avoidance and Cost of Compliance
- DEMO and Hands On

Speaker and Presentation Credit



On top of Camp Muir



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Mr. Stuber has practical experience and expertise in the areas of Indoor Air Quality (IAQ), LEED investigations and surveys from a laboratory perspective, industrial hygiene consultation, and regulatory compliance. He has worked with both USA and Global clients to assist them regarding IAQ investigations, industrial hygiene technology, sampling plans, training, and regulatory interpretation. Ed has over 30 years of experience in industrial hygiene laboratory operations and is responsible for supporting industrial hygiene laboratory clientele, both in the US and abroad and technical consultation for industrial hygiene sampling and analysis projects.





- MSHA silica standard last updated - 1985
- OSHA silica standard last updated - 2016
- Chris Williamson – Assistant Secretary of Labor for MSHA

The purpose of this proposed rule is simple – to better protect the miners from exposure to silica so they do not have to suffer from entirely preventable debilitating and deadly occupational illnesses. Silica overexposures have a real-life impact on a miner's health.



Where is Silica Found?



- Quartz glass
- Vitreous glass
- Fused silica
- Opals
- Sand
- Mortar
- Concrete
- Abrasive
- Porcelain
- Paints
- Bricks

Crystalline Silica Polymorphs



- α -Quartz
 - Most common



- Cristobalite
 - formed at high temps 1400°C
 - foundry processes, brick
 - manufacture, ceramics



- Tridymite
 - Common in volcanic rock
 - Very rare in the workplace



Exposure Hazards



Exposure Hazards – each of these illnesses is chronic, irreversible, and potentially disabling or fatal.

■ Pneumoconiosis

- Occupational lung disease caused by inhalation of dust
- 2,600 US deaths recorded in 2013, includes asbestosis, silicosis, coal workers' pneumoconiosis, byssinosis

■ Silicosis

- Primary health effect associated with inhalation of respirable crystalline silica
- Progressive fibrosis caused by deposition of respirable particles
- Irreversible
- ~600 US deaths attributed in 2013

■ Lung cancer

- Chronic obstructive pulmonary disease (COPD)
- Kidney disease
- Increases the risk of contracting tuberculosis and other infections



**Mine Safety and
Health Administration**

Proposed MSHA Silica Standard

178 pages as a PDF



Proposed MSHA Silica Standard

First proposed June 30,2023, published in
Federal Register July 13,2023

3 public hearings – last one on August 21,2023

Extension of the comment period to September
11, 2023 on August 14, 2023



**Mine Safety and
Health Administration**



**Mine Safety and
Health Administration**

Along with the new 2016 OSHA SILICA Standard - Expected to prevent 1,000X of deaths from silicosis, lung cancer, other respiratory disease

600 deaths per year attributed to silica exposure

900 new cases of silicosis per year





Proposed
MSHA
Silica
Standard -

50ug/m³ TWA

Current MSHA Silica
Standard –



**Mine Safety and
Health Administration**



Mine Safety and Health Administration

The TLV is the PEL.

SWA mg/m³ = The amount of dust that was measured in the air. (SWA means "Shift Weighted Average") - This is based on 480 minutes no matter how long the sampling event lasted.

TLV mg/m³ = The allowable limit for that sample that the measured amount (SWA) had to fall below. (TLV means "Threshold Limit Value").

TLV*EF mg/m³ = The level at which MSHA could issue a citation. MSHA uses a 20% error factor to account for inaccuracies in the laboratory procedure (the method has a plus or minus 20% variation).

SWA/TLV*EF = How close your sample was to the citation level (<1 means the result is below the Citation level. The closer to 1, the closer this sample was to exceeding the citation level).

Measured results above the citation level indicate that some action needs to be taken to reduce the exposure. Making engineering changes to reduce the exposure and then re-sampling to make sure that the changes had the desired effect is the preferred course of action.

Results measured below the citation level means that your operation is in control.



Proposed Exposure Limits

- 8-hour Time Weighted Average (PEL)
 - 50 micrograms/cubic meter ($\mu\text{g}/\text{m}^3$)
- Action Level (AL)
 - 25 micrograms/cubic meter ($\mu\text{g}/\text{m}^3$)
- Requirements for
 - Exposure assessment
 - Limiting access to areas of potential silica exposure
 - Engineering controls and work practices
 - Medical exams
 - Training



Proposed MSHA Silica Standard - IMPACT on GALSON

Went from 2 to 4 XRD instruments when OSHA rule came out – 2016 (1 in 2018 and another in 2019)

current capacity is 1500 samples per week – 78,000 annual

currently running at 46% capacity (700 per week)

current samples per year – on pace for 36,000

Past samples per year:

2018- 50,000
2019- 58,900
2021- 33,400
2022- 34,000

current turnaround time – 5.5 days



Mine Safety and Health Administration



Exposure Assessment



Exposure Assessment Initial Compliance



- Initial exposure monitoring of employees who are, or may reasonably be expected to be, exposed to crystalline silica
- Determine employee exposure levels
 - $>50 \mu\text{g}/\text{m}^3$ (PEL)
 - $<50 \mu\text{g}/\text{m}^3$ and $>25 \mu\text{g}/\text{m}^3$ (between PEL and Action Level)
 - $<25 \mu\text{g}/\text{m}^3$ (Below Action Level)

-Calibrated Pump
pm

SKC Alumina
Holder for Re
(quartz only)



Exposure Sampling

3 Piece P
Casset

-Calibrated Pump
pm

SKC Alumina
Holder for Re
(quartz only)

3 Piece P
Casset

al Noise

Working with SGS Galson



Setting up accounts – one or many-

[Registration | SGS Galson](#)

Placing orders –

- email
- toll free call
- chat

COC – online/client portal

- sample ID
- field blank
- dust or no dust
- type of silica
- air vol

Benefits:

- free pumps and accessories
- results in 5 business days
- free media -unless PPIs
- free CIH support

-Calibrated Pump
pm

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Casset

al Noise

Common Mistakes:



Incorrect flow rate –

will not be a respirable sample

Insufficient air vol –

will not meet detection limit

No turnaround time-

results could be late

No field blank-

results could be questioned

Incorrect field calibration-

not calibrating with media in line

Incorrect sample handling-

no COC, cyclone tipping

Not indicating type of silica

Delays start of analysis

Exposure Sampling



Samplers must meet ISO 7708:1995 specifications

- 4 μm 50% Cut Point (Previous OSHA Standard 3.5 μm)

However, Dorr-Oliver cyclones can still be used

Cyclones selected based on several factors



Higgins Dewel Cyclone



Dorr-Oliver Cyclone



SKC Aluminum

Exposure Sampling



- Samplers must meet ISO 7708:1995 specifications
NEW and IMPROVED



- Alternative to Cyclone – SKC Parallel Particle Impactors (PPI) Sampler
 - Meets Standard Requirements
 - Single use or Re-Usable
 - 2, 4, or 8 LPM Models

- Pros:
 - Removes some problems associated with cyclones
 - Availability of High-Flow Personal Sampling Pumps
- Cons:
 - Single use adds cost

Exposure Sampling



- Samplers must meet ISO 7708:1995 specifications
NEW and IMPROVED



- Alternative to Cyclone and SKC Parallel Particle Impactors (PPI) Sampler

The DRS is a Disposable Respirable Sampler

- Meets Standard Requirements
- Single use
- 2 LPM Model

- Pros:
 - Removes some problems associated with cyclones
 - Availability of High-Flow Personal Sampling Pumps
- Cons:
 - Single use adds cost – but not as much as the PPI



Cost Avoidance and Cost of Compliance



Cost Avoidance and Cost of Compliance

- OSHA estimates annual monetary benefits of \$8.7 billion/year based on reduced mortality and morbidity
- Projected annual costs of compliance are ~ \$1 billion

OSHA's Projected Annualized Costs

Engineering Controls	\$661,456,736
Respirators	\$32,884,224
Exposure Assessment	\$96,241,339
Medical Surveillance	\$96,353,520
Familiarization & Training	\$95,935,731
Regulated Area Access Control	\$2,637,136
Written Exposure Control Plan	\$44,273,091
Total Annualized Costs	\$1,029,781,777



Thank you!

Do you have any questions?
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