OSHA Respirable Crystalline Silica Standard Update

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OSHA’s Final Rule on Respirable Crystalline Silica

- March 25, 2016 Standard Published
- June 23, 2016 Effective date
- Construction
  - June 23, 2017 Obligations Commence (except)
  - June 23, 2018 Methods of analysis
- General Industry
  - June 23, 2018 Obligations Commence (except)
  - June 23, 2020 Medical surveillance above action level
  - June 23, 2021 Engineering control for fracking
- Legal Challenge to standard is in process
Crystalline Silica
Litigation Update

• April 2016- Case Consolidated in DC Circuit Court of Appeals
  – AFS & NAM challenging the rule
  – U.S. Chamber filed, withdrew, moved to intervene
  – Industry groups include National Stone, Sand & Gravel Assn., brick industry, masonry and construction groups
  – Union groups include building trades and AFL-CIO

• November 2016- Initial briefs filed
• February 2017- Reply briefs to be filed
• May 2017 – Oral arguments
• Three Judge Panel Not Yet Named
Grounds for the Silica Legal Challenge

- Must be based on Substantial Evidence in the Record

- Key Issues for AFS/NAM
  - Challenges to technical and economic feasibility, cost projections

- Key Issues for US Chamber
  - Scientific basis for rule (best available science) and lack of proof that 50 ug/m3 will prevent disease or disease is caused at current PEL

- Key Issues for National Stone, Sand, and Gravel Assn
  - Questions about laboratory proficiency and whether sufficient labs are available to meet demand for employer exposure monitoring

- Key Issues for Unions
  - PEL too high, Need for medical surveillance for construction and medical removal protection for industry
Silica Litigation
Potential Outcomes

• **Standard could be Upheld**
  – Industry could appeal
  – Industry could live with it

• **Standard could be Vacated**
  – OSHA could appeal
  – Unions could appeal

• **Standard could be Remanded to OSHA**
  – OSHA could go back to fix errors
  – OSHA could negotiate a fix
What are the Chances of Success?

- Health Risk:
  - Courts tend to side with agency

- Economic and Technological Feasibility
  - Courts may look at record
  - OSHA ignored a lot of good data
  - Annualized cost per foundry estimated by OSHA
    - $57,403 per iron foundry
    - $10,149 per aluminum foundry
    - $8,565 per other non-ferrous foundry
What about the Trump Factor?

• Standard is final. Any changes must go through notice and comment process.
• Congressional Review Act does not apply
  • Deadlines are past
  • OSHA submitted all required reports on time
• Congress could hold back funds for enforcement
• OSHA could extend dates for compliance
• OSHA could issue reasonable compliance guidance (e.g. interpretation of feasibility)
Actions To Take Now

1. Get ready for Compliance Dates
   - Do not count on legal victory
   - Many provisions will likely survive legal challenge and settlement negotiations (air monitoring, medical surveillance, respirators, training)

2. Know your numbers

3. Identify your sources

4. Document engineering control efforts, including failures.

5. Help with legal fund
Contents

• Understanding respirable crystalline silica (RCS)
• Summary of the OSHA Rule
• Key compliance challenges
Respirable Crystalline Silica

- What it **IS**
- Silicon Dioxide (SiO$_2$)
- 12% of Earth’s crust
- Occurs widely in nature as *sand*, quartz, flint, diatomite
- Lake sand is >95% silica (quartz)
- Present in mortar and cement
- Present in many rocks (shale, sandstone, slate, shale)
Respirable Crystalline Silica

• What it **IS NOT**
• Silicates,
  • Olivine \([(\text{Mg}^{+2}, \text{Fe}^{+2})2\text{SiO}_4]\),
  • Zircon \([\text{ZrSiO}_4]\)
  • Mullite \([(3\text{Al}_2\text{O}_3)2\text{SiO}_2 \text{ or } (2\text{Al}_2\text{O}_3)\text{SiO}_2]\).
  • NOTE: many silicates contain quartz (25-40% in Granite)
• Chromite \([(\text{Fe, Mg})\text{Cr}_2\text{O}_4]\)
• Silicon
Respirable **Crystalline** Silica

- Includes:
  - **Quartz**
    - Cristobalite
    - Tridymite
    - (lake sand is 95+% quartz)
Respirable **Crystalline** Silica

- Does **not** include
  - Amorphous forms (diatomaceous earth)
  - Glass, quartz glass
  - Vitreous quartz, vitreous silica
  - Fused quartz, fused silica
  - Silica gel
Respirable Crystalline Silica

- Only very small particles reach deep into the lung

Figure 2: Particle deposition in respiratory system

Less than 5 microns
Respirable Crystalline Silica

• For reference
  • Visible >80 microns
  • Human hair (>50)
  • Fine sand grain (~100)

Respirable particles are not visible
Respirable Crystalline Silica

- Smaller particles are visible in a light beam
Respirable dust does not follow the law of Gravity

In still air

Respirable particles can float for days.
Key Elements of OSHA RCS Standard

C. Permissible Exposure Level (PEL)
D. Exposure Assessment
E. Regulated Areas
F. Methods of compliance
G. Respirators
H. Housekeeping
I. Medical Surveillance
J. Communication
K. Recordkeeping
(c) Permissible Exposure Limit (PEL)

- Exposure = exposure without a respirator
- PEL - $50 \, \mu g/m^3$
  - 8 hour time weighted average
- Action level – $25 \, \mu g/m^3$
- PEL is for exposure to quartz only
  - Old PEL was for dust
  - Old PEL varied with % quartz
  - Old PEL was equivalent to $100 \, \mu g/m^3$ quartz
How much is 50 µg/m³?

• One gram of respirable silica sand (equivalent to artificial sweetener packet) would generate exposure level above the new PEL in a space the size of a football field 13 feet high.
(d) Exposure Assessment

- Each employee reasonably expected to be over the action level
- Scheduled monitoring
  - Initial each shift/job classification/work area
  - Periodic
    - Semiannual monitoring if over AL
    - Quarterly monitoring if over PEL
- Performance option
  - Combination of air monitoring and objective data
  - Allowed to use ranges (e.g. >PEL)
- Employee Notification of results
Performance Option – one method

• Exposure mapping
• Real time instruments
• Measure dust, not quartz
• Need to use conversion factor
• Advantages:
  • Speed
  • Identify root causes
(e) Regulated Areas

- The employer shall establish a regulated area wherever an employee’s exposure to airborne concentrations of respirable crystalline silica is, or can reasonably be expected to be, in excess of the PEL.
- Demarcate and post
- Limit access
- Respirators are required when in a regulated area
Possible approaches

• Regulate everything
  • Easy
  • Must enforce respirators
• Use exposure map as criteria
  • Effective
  • May include people whose TWA is <PEL
• Narrowly defined areas
  • E.g. grinder is RA but aisle is not
  • Respirator for grinder but not fork truck driver
• Temporary areas for larger castings
  • E.g. RA on shake out days but not molding days
(f) Methods of Compliance

- Mandatory Hierarchy of Controls
- Must use engineering and work practice controls
  - Unless employer can demonstrate controls are not feasible
- When feasible controls are not sufficient
  - Use them anyway to reduce exposures
  - Supplement with respirators
- Respirators cannot be used as primary control
- Employee rotation IS allowed
Written Exposure Control Plan

• Not limited to exposure above PEL
• Required elements: description of -
  • All tasks with RCS exposure
  • Controls for each task (engineering, work practice, respiratory protection)
  • Housekeeping measures used to limit exposures
• Annual review and update
• Can be useful for documenting feasibility
(g) Respiratory Protection

- Follow respirator standard (1910.134)
- Required when:
  - PEL exceeded and controls are being installed
  - PEL exceeded and controls are not feasible
  - Maintenance and repair tasks >PEL
  - Regulated areas
(h) Housekeeping

- When it can contribute to exposure, employers must not allow:
  - Dry sweeping or brushing
  - Use of compressed air for cleaning surfaces or clothing, unless it is used with ventilation to capture the dust
- Those methods can be used if no other methods like HEPA vacuums, wet sweeping, or use of ventilation with compressed air are feasible
Is compressed air used for “cleaning”? Is it part of the process? Can it contribute to exposure?
(i) Medical Surveillance

• Eventually applies to all employees >AL for more than 30 days per year

• Purpose:
  • ID problems for early intervention
  • Advisability of continued exposure
  • Fitness for respirator use

• Frequency: Initial and every 3 years

• PLHCP (physician of other licensed health care professional)
Medical surveillance

• Content
  • Medical and work history
  • Physical exam
  • Chest x-ray
  • Pulmonary function exam
  • TB test (initial exam only)
  • Any other test deemed necessary by PLHCP
• Information to PLHCP on work duties, exposures and PPE
• Specialist exam if recommended by PLHCP
(j) Communication

• Comply with HCS-2012 (1910.1200)
• Health effects (cancer, and lung, kidney and immune system effects)
• Signs at regulated areas
• Employees >AL must demonstrate knowledge and understanding of:
  • Silica health hazards
  • Tasks with exposure and protective measures
  • Provisions of OSHA’s standard
  • Purpose and description of medical surveillance
• Must make copy of RCS standard available
(k) Recordkeeping

• Accurate record of employee exposure assessments
  • Monitoring information
    • Date, task, sample method, laboratory, PPE
    • Names, jobs, SSN of those monitored and represented
  • Objective information

• Medical surveillance
  • Opinion of PLHCP
  • Copy of information provided to PLHCP
Key Compliance Challenges

• Problem areas
• Leaks
• Housekeeping
  • Compressed air
  • Sweeping
• Cleaning and Finishing
• Feasibility
What is the Typical Range of RCS Data

Data from OSHA Final Standard 81FR16422
Leaks in Sand Transport Systems
Sand build up and spillage

- Basement
- Molding sand tower
Preventing leaks is better than clean up
Plug Flow Pneumatic Sand Transport

- Lower velocity
- Lower wear
- Fewer leaks
- Schedule 40 vs. 80 pipe
- Less air consumption
Compressed Air
Vacuums for Sand: Not as simple as OSHA thinks
Sweeper Issues

- Floor sweepers
  - Sweeper of Vacuum?
  - No riding HEPA floor sweeper available currently
  - Wet sweepers may be incompatible
  - Can generate dust if vacuum is not balanced or if floor is cracked or uneven or hopper full
  - Nevertheless they may be effective
To sweep or not to sweep?
Sweeper practices

- HEPA filtration
- Filter plug and hopper full alarms
- Skirts for side brushes
- Water mist for side brushes (charged)
- Improve and Clarify OSHA sweeper acceptance
- Documented infeasibility of other methods may be key to using sweepers
What If a You Can’t Meet the PEL

• Use engineering and work practice controls “unless the employer can demonstrate that such controls are not feasible”

• Where feasible controls are not sufficient use them to reduce exposures to lowest feasible level and supplement with respirators

• ADVICE: Determine and document what is feasible. Do not guess. Do not default to trial and error.
Be Proactive On Feasibility

• Determine what is feasible
  • Effective at reducing silica levels
  • Does not interfere with producing quality product
  • Useable/ Acceptable to employees
  • (Affordable)

• Take control of the process
  • Determine root causes
  • Document analysis and decisions
  • Use industry publications
  • Be prepared to defend position
Performance Factors Checklist for Measures to Control Worker Exposures to Air Contaminants in Foundries

- Effectively addresses potential exposure sources.
- Can feasibly be installed in this operation.
- Does not create new hazards to safety and health.
- Does not disrupt the capability to produce a quality product.
- Is acceptable to workers. (no incentive to defeat)
- Standards of performance are defined and performance monitoring methods are established.
- Can readily perform reliably with periodic maintenance and worker training.
- Reduces/eliminates the sources of air contaminants.
- Reduces/eliminates the need for respiratory protection.
Be Smart About Control

• Understand the dust source
  • Make sure you address the real problem

• Pay attention to mass balance of air
  • Supply is as important as exhaust
  • Where does air (and dust) move

• You can’t fight physics
  • 100 FPM hood capture velocity will not capture 16,000 FPM particle
  • Thermal currents are important

• Focus on the little particles (HEPA filters)
Questions

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Common Root Causes of Respirable Dust

- Shakeout (vibration and turbulence)
- Knockoff/ sorting
- Grinding
- Refractory repair
- Vibrating conveyors
- Transitions
- Leaks in sand systems, abrasive blast systems
- Compressed air
- Sand Spillage
- Foot and vehicle traffic
Mystery!!

- Sand is **95%** quartz

- A typical foundry respirable dust air sample contains only about **5-15%** quartz

- WHY the difference?????
Vibration from Shake Out Generates Respirable Dust
Knockoff: vibrating conveyors, impact
Conveyor transitions
Abrasive Blast Leaks
Castings Grinding
ADHERED SAND

ROUGH SURFACE

BURN-ON/BURN-IN

STAGES OF METAL PENETRATION
PRIMARY DUST TRANSPORTING MECHANISMS
WITH CASTING ON WORKPIECE REST
EFFECT OF GRINDING HOOD ON DUST TRANSPORTING MECHANISMS

REFERENCE ACGIH FIGURE VS-80-10
Exhaust Air Used in Many Foundry Operations; Pay Attention to Replacement Air Patterns